SERIAL NO. CIV. ENG.-19-016-63-56

HOUSATONIC RIVER FLOOD CONTROL PROJECT

NORTHFIELD BROOK DAM

NORTHFIELD BROOK, CONNECTICUT

SPECIFICATIONS

FOR THE

CONSTRUCTION OF DAM

AND

APPURTENANT STRUCTURES

U.S. Army Engineer Division, New England
Corps of Engineers
Waltham, Mass.

MARCH 1963

Serial No. CIVENG-19-016-63-56

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
424 Trapelo Road
Waltham 54, Mass.

29 March 1963

AMENDMENT NO. 1 to Invitation for Bids Serial No. CIVENG-19-016-63-56 dated 15 March 1963 for CONSTRUCTION OF NORTHFIELD BROOK DAM AND APPURTENANT STRUCTURES, NORTHFIELD BROOK, CONNECTICUT, bids for which will be opened 16 April 1963 at 2:00 p.m., E.S.T.

1. Prospective bidders and all concerned are hereby informed of the following changes in Invitation for Bids Serial No. CIVENG-19-016-63-56 and are requested to change all copies accordingly:

(A) TABLE OF CONTENTS.

Section 18, "STORAGE BUILDING", is added to the listing of sections under the Technical Provisions.

(B) SPECIFICATIONS, PART II, SPECIAL CONDITIONS.

1/ Page SC-1, Subparagraph SC-1a. - (i) The following is inserted in the 6th line after the word "proceed":

"except that the storage building will be completed in sufficient time to perform the required soils and material control at the project site as required under Paragraph SC-38".

(ii) The following is added at the end of this subparagraph:

"Paragraph SC-53 contains intermediate completion dates for segments of the work."

2/ Page SC-15, Paragraph SC-36 "TEMPORARY HEAT". - The following subparagraphs are added to this paragraph:

"a. Only temporary heating devices having the approval of the Underwriters' Laboratories, Inc., and approved by the Government representative in charge will be used. The contractor will be required to instruct his personnel in the use and operation of these portable type heaters. Such instructions shall be directed to any and all workmen who will have responsibilities connected with the use of such heaters. Instructions will include proper use, handling, location and placement of such heaters when in operation, fire protection provided, hazards connected

Am. #1

with the use of such heaters and actionsto be taken in case of fire. Portable oil-fired, or gas heaters, will bo so placed that the heating end will not be directed at combustible material within 10 feet and the unit, itself, shall be at least 2 feet from combustible material.

"b. The contractor will be required to provide and maintain a telephone or other means of communication which will be in an easily accessible location at each of the large construction areas on the project where potential fire hazard exists. Such means of communication will be accessible during all work hours."

3/ Page SC-15, Subparagraph SC-38a. - (i) In the 23rd line the word "Area" is inserted after the word "Government".

(ii) The following is inserted in the 25th line after the word "Dam":

"The project laboratory will be located in the Storage Building (see Section 18)."

(iii) In the 27th line, the word "Area" is inserted after the words "job site to".

(C) SPECIFICATIONS, PART III, TECHNICAL PROVISIONS.

1/ Page 2-1, Subparagraph 2-05b. - (i) In the second line a comma is inserted after the word "drainage", and the comma after the word "dewatering" is deleted.

(ii) In the second line on Page 2-2, the word "and" after the word "areas" is deleted.

2/ Page 3-4, Subparagraph 3-03b(1). In the first line the word "of" is charged to "or".

3/ Page 3-7, Subparagraph 3-06b "Clearing and Stripping". The following is added at the end of this subparagraph:

"Stripping material containing humus and organic material shall be salvaged and stockpiled for use in the borrow area as specified in subparagraph e, below."

4/ Page 3-8, Subparagraph 3-06e "Placing Stripping Material". In the sixth line the word "extension" is corrected to read "extensive".

5/ Page 3-9, Subparagraph 3-06f "Sequence of Operations". In the sixth line, the word "explorations" is deleted and the word "excavations" is substituted therefor.

6/ Page 3-9, Subparagraph 3-07b, "Final Grades and Excavation Lines". In the 27th line on Page 3-10, the word "plans" is corrected to read "planes".

7/ Page 3-15, Subparagraph 3-10e, "Machine and Hand Cleaned Rock Surfaces". - The following is added at the end of this subparagraph:

"Payment for cleaning of rock surfaces upon which concrete is to be placed is included under the applicable concrete items".

8/ Page 5-2, Subparagraph 5-03a(2), "Gravel Fill on Bedrock". In the last line the word "constructed" is corrected to read "compacted".

9/ Page 5-7, Subparagraph 5-05b, "Bedrock Foundations for Embankments". - In the 8th line "SS-A-231b" is changed to "SS-A-281b".

10/ Section 18, "STORAGE BUILDING", copy attached with this amendment, is inserted at the end of the Technical Provisions.

(D) BID FORM.

Page UPS-3 is superseded by Page UPS-3, as revised 29 March 1963, copy inclosed with this amendment.

2. This amendment must be acknowledged by insertion of Amendment No. "1" in the space provided therefor in the Bid Form or by separate letter or telegram prior to opening of bids. Failure to acknowledge all amendments may cause the bid to be considered not responsive to the invitation, which would require rejection of the bid.

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS

Incl.
Section 18, with sketch
Page UPS-3, revised 29 March 1963

SECTION 18

STORAGE BUILDING
(Item 45)
(INDEX)

SECTION 18

STORAGE BUILDING
(Item 45)

18-01. SCOPE. - a. The work covered by this section of the specifications consists in furnishing all labor, plant, equipment, materials and appliances, and performing all operations in connection with construction of a storage building, complete, in strict accordance with this section of the specifications and Drawing No. HC-1-1696, inclosed at end of this section), and subject to the terms and conditions of the contract.

b. The storage building will be located west of existing Litchfield Street between the downstream toe of the dam and the spillway discharge channel. The exact location will be determined in the field. The contractor shall provide a suitable access road to the building.

c. The storage building will be utilized as a project laboratory during the work under this contract. The contractor shall maintain access to the building at all times, and shall provide janitor and maintenance services and shall pay for all electricity used during the contract work. The contractor shall provide drinking water, bottled water type dispenser, in the building.

d. All items installed in the building shall remain and become the property of the Government. The temporary electric service shall be removed.

18-02. EXCAVATION, BACKFILLING AND GRADING. - a. General. - All work shall be executed as required to construct the building. Shoring and unwatering the construction area shall conform to the applicable requirements of Section 3, EXCAVATION, and as stated below. All excavation shall be unclassified and shall include the removal of any rock and boulders encountered.

b. Grading. - The entire building area shall be rough graded prior to excavation or fill for the building foundations. Fill shall be brought up to the underside of subgrade for sand and gravel drainage fill under slabs.

c. Excavation. - Excavations shall conform to the dimensions and elevations shown on the drawings or as required for the construction of features covered in this section. Excavation shall generally extend 12 inches outside the walls to allow for placing and removal of forms, installation of services, and for inspection. Undercutting will not be permitted. Suitable excavated material which is required for fill under slabs shall be separately stockpiled as directed.

d. Excess Material. - Material from excavation, not required for fill or backfill, shall be used or disposed of as specified for material removed by unclassified excavation, general, in Section 3 of these specifications.

e. Sand and Gravel Fill. - Sand and gravel fill under concrete slabs including ramp shall meet all the requirements for Gravel Fill Material as specified in Section 5, except that the material shall contain no stones greater than 3 inches in size. The 12-inch layer of sand and gravel fill beneath floor slabs shall be placed in two layers and compacted by four coverages of vibratory compactors or pneumatic tampers.

f. Filling Near Foundation Walls. - Where filling is done beside foundation walls, the fill shall be brought up essentially at the same heights on both sides at all times until the maximum level at the lower side is reached. Where a higher level of fill is required on one side of the foundation wall, the higher level must be properly compacted. Where a roller or tractor is used for compaction, the roller or tractor edge must not approach nearer than four feet from the face of the wall.

g. Backfilling. - After completion of foundation walls and other construction below the elevation of the final grade, and prior to backfilling, all forms shall be removed and the excavation shall be cleaned of all trash and debris. Material for backfilling shall consist of materials from required excavations or other materials approved by the Contracting Officer. Each layer shall be compacted by machine tampers or by other suitable mechanical equipment to a density that will prevent excessive settlement or shrinkage. Precautions outlined above relative to filling near foundation walls, shall be observed while backfilling.

18-03. CONCRETE. - a. General. - All concrete work required for the building shall conform with the applicable requirements of Section 9, CONCRETE, with the following additional provisions:

(1) The maximum size aggregate shall not exceed 3/4-inch.

(2) Finish. - The exposed concrete surfaces shall have all fine and rough edges removed, holes remaining from the bolts or rods and slight honeycomb and minor defects patched with mortar composed of 1 part cement to 2 parts sand. Concrete floor and ramp shall be left with a wood float finish.

(3) Expansion Joints. - Expansion joints shall be constructed as indicated on the drawings and where slab abuts vertical surfaces. Joints between slabs on earth and vertical surfaces shall be premolded expansion-joint filler strips conforming to Federal Specification HH-F-341a. Joints shall be 1/2-inch thick and the full depth of slab. Edges of concrete floor or along expansion joints shall be neatly finished with a slightly rounded edging tool.

b. Slab on Grade. - The subgrade shall be brought to an even plane and compacted solid. Sand and gravel fill shall be deposited to the indicated thickness, and compacted and graded reasonably level. The fill shall be covered with vapor barrier. Concrete shall be deposited to the required thickness, and finished as specified above.

18-04. SHEET METAL WORK AND MISCELLANEOUS METALS. - a. Materials. - (1) Anchor bolts for anchoring the sills to the foundation walls shall be 1/2-inch diameter, 12 inches long, spaced on four-foot centers. The projecting portion shall be given a coat of red lead.

(2) Sheet metal for cap flashing over doors and windows shall be 16-ounce cold rolled copper.

b. Flashing. - Cap flashing shall be provided at head of doors and windows to provide watertight protection. Exposed edges of all flashings shall be folded back 1/2 inch to provide stiffness. Flashing at openings shall extend not less than 4 inches beyond the jambs of the opening. Wall flashings shall be installed, as required, to provide watertight construction.

18-05. CARPENTRY. - a. Lumber and Woodwork. - Lumber shall conform to Federal Specification MM-L-736 for "Lumber and Timber, Hardwood", and MM-L-751c for "Lumber and Timber, Softwood". A certificate of conformance with Federal Specifications will be accepted in lieu of inspection requirements. At the contractor's option, lumber for the various uses shall be one of the species listed for the purpose and of the grade indicated.

(1) Rough Carpentry. -

	SPECIES AND GRADE		
	Douglas Fir Sitka Spruce Western Red Cedar	Northern White Pine Eastern Spruce	White Fir
Rafters, Sills and Joists	Any stress-graded species. - 1100 f., 850 c., 1,320,000 E. (Unless otherwise indicated on the drawings).		
Studs, Plates, Caps Nailers	Standard	No. 2	No. 2
Roof and Wall Sheathing	Interior type plywood with exterior glue, C-D grade, minimum 1/2 inch thick.		
Bridging Ridge Boards and Bracing	Standard	No. 3 Boards	No. 3

(2) Exterior Finished Carpentry. -

	SPECIES AND GRADE	
	Douglas Fir Sitka Spruce Western Red Cedar	Northern White Pine Eastern Spruce
Siding	C and better	C Select
Cornices	C and better	C Select
Trim and Corner Boards	C and better	C Select
Window and Door Frames	Practically clear material without obvious defects. Window jambs, parting strips, and sills of Douglas fir, and sills of Sitka spruce shall be VG or EG. Door frames shall be of second grade for paint finish.	Practically clear material without obvious defects. Window jambs, parting strips, and sills of Douglas fir, and sills of Sitka spruce shall be VG or EG. Door frames shall be of second grade for paint finish.

b. Other Materials. - (1) Waterproof Sheathing Paper.- Waterproof sheathing paper shall conform to Federal Specification UU-P-147b for "Paper; Building, Waterproof", Type I, Class B.

(2) Lag Screws. - Lag screws shall conform to Federal Specification FF-B-561a for "Bolts; Lag".

(3) Nails. - Nails shall conform to Federal Specification FF-N-105 for "Nails; Wire and Staples".

(4) Screws. - Screws shall conform to Federal Specification FF-S-111a, for "Screws; Wood, Slotted-Head".

(5) Asphalt Saturated Felt. - Asphalt saturated felt shall conform to Federal Specification HH-F-191a for "Felt; Asphalt-saturated (for) Flashings, Roofing, and Waterproofing".

(6) Glass. - Glass shall conform to Federal Specification DD-G-451a for "Glass, Flat and Corrugated for Glazing, Mirrors and Other Uses".

c. Framing and Boarding. - Lumber and Other Rough Work. - Lumber and other rough work shall be properly framed, closely fitted, accurately

set to the required lines and rigidly secured in place. No shims will be allowed on wood or metal bearings. Members shall be framed to allow for passage of pipes to avoid cutting of structural members. No members shall be cut, notched, or bored for the passage of such pipes without prior approval. All corners shall be wind braced. Ridge shall be straight and true intersections of the roof planes. Rafters on plates and ridge shall be framed with close joints. Blocking not less than 2 x 4-inch stock or size of framing member shall be placed between rafters and studs where necessary to form nailings for roof and wall sheathing. Bridging shall be provided where shown.

(2) Wall and Roof Sheathing. - All nailing shall be into framing. No nails shall be visible from interior of building.

(a) Wall Sheathing. - Edges or ends of plywood sheets shall extend over and be nailed to sill and top plates. End joints shall be butted over centerline of supports and when applied horizontally, end joints shall be staggered. Eightpenny common nails shall be used. Nails shall be spaced 6 inches on centers along ends and bearing edges and 12 inches on centers along intermediate bearings. Waterproof sheathing paper shall be applied over sheathing, shall be applied horizontally, starting at bottom, and lapped 6 inches at edges and ends.

(b) Roof Sheathing.- Plywood shall be provided with blocking installed at edges of sheets or H-shaped metal clips designed for the purpose shall be inserted along the edges midway between supports. Plywood panels shall be continuous over two or more spans, applied with the face-ply grain across supports and secured at 6 inches on centers along ends and bearing edges and at 12 inches on centers along intermediate bearings with eightpenny common nails. End joints shall be butted over the centerline of supports and staggered.

(3) Rafters shall be 2" x 6", spaced 24 inches on centers.

(4) Studs. - Studs shall be 2" x 4", spaced 16 inches on centers. Plates resting on concrete walls shall be anchored in place with 1/2 inch bolts. Studs shall be built up double round openings and trussed over all doors and windows. Corners shall be thoroughly spiked together and made solid. All bearing partitions shall be provided with top and bottom plates. Walls shall have at least one row of horizontal bridging full width of studding, cut and securely nailed unless additional bridging is indicated. Studs shall be framed as shown or required for the proper installation of plumbing. Nailing strips shall be cut as required for the support of fixtures of all kinds.

d. Exterior Finish. - (1) All exterior finish shall be milled from materials specified and erected in strict conformance with details. The exposed surfaces of finish woodwork shall be smooth and ready to

receive paint or other finish. All nailing shall be blind or face nailing as required with face nails set for putty-stopping. Cornice and other exterior trim and millwork shall be constructed so that water cannot pass through the joints. Molded work shall be coped at returns and interior angles and mitered at corners. Intersections of flat work shall be shouldered. Rake mouldings shall be run to profile required to miter with horizontal moldings.

(2) Wood Siding shall be drop siding type and shall be applied over the specified wall sheathing and building paper. Ends of boards likely to split when nailed shall be drilled. End joints shall be made over centerline of framing supports. Joints shall be staggered and, when made on same support, shall be separated by at least two courses. End joints and joints at openings, corners, and gables shall be made with white-lead paste. One only of the following species of the grade stipulated shall be used. Siding shall be nailed to each support with not less than two nonferrous metal nails. Nails shall be of the length that will penetrate sheathing and provide not less than 1-1/2 inch penetration into support. Drop-siding courses shall fit full into the worked edges of the adjacent boards without forcing.

e. Window Frames. - Double-hung frames shall have 3/4 inch jambs, heads, and blind stops, 1/2- by 3/4-inch parting strips, 1-5/8-inch sills and 1-1/8-inch side and head casings. Jambs or heads shall be cut as required by the type of spring balances specified. Sills shall be run with weather breaks on top and one or more grooves on bottom. When staff beads are required, they shall be loosely attached.

f. Sash. - Nominal thickness of double-hung sash shall be 1-3/8-inches. Ponderosa Pine sash shall conform to CS 163-59. Sash of Douglas fir, cypress, or southern pine shall be of the same construction and quality as specified for Ponderosa Pine. Double-hung sash shall be check-rail type, shall be grooved for attachment of spring balances. Sash shall be fitted closely after frames are set, shall be made to work free and easy, and shall be well-balanced. All sash shall be glazed with Type II, B quality, double-strength, clean glass conforming to Federal Specification DD-G-451a for "Glass; Flat and Corrugated (for) Glazing, Mirrors and Other Uses". All glass shall be set in best quality putty.

g. Insect Screens. - Insect screens (half screens) of 16-mesh non-ferrous screen cloth shall be provided for all double-hung windows. The window openings shall be provided with aluminum channel slides properly installed. Window screen frames shall be of 3/4 inch stock with top rails and stiles 1-1/2 inches wide and bottom rails 2 inches wide.

h. Door Frame. - Exterior door frame shall be 1-3/4 inches thick, double-rabbeted from the solid. Double wedge blocking shall be driven back of jambs at nailing points and at back of butts and lock strikes.

i. Doors.- (1) General. - Doors shall be of design and sizes indicated and shall be fabricated in accordance with the best practice of the trade, with all joints properly formed, tightly fitted and tenoned. Exterior door shall be flush, 1-3/4-inch thick. Exterior door shall be completely weatherstripped.

(2) Swing Door. - Top and bottom edges of door shall be given two coats of spar varnish at the factory before shipment. Exterior door shall be fabricated with water-resistant adhesives. Exterior flush door shall be softwood-veneered and shall have solid cores of the stile-and-rail type. Door, when constructed without cross-banding, shall have sawn or sliced face veneers not less than 3/16-inch thick before sanding, and when cross-banded, combined thickness of cross-banding and face veneer on each face shall be not less than 3/16-inch before sanding. Otherwise, softwood-veneered door of Ponderosa Pine shall conform to CS 120-48, grade 1; of Douglas fir, Sitka spruce, or western hemlock shall have vertical grain faces for paint finish and construction and quality shall be equal to those required by CS 91-41.

(3) Overhead Door. - Door shall be sectional overhead and of size as indicated on the drawings, and shall be constructed of 1-3/8-inch thick, mortised and tenoned, glued, steel doweled, stiles and rails with rebated weather joints throughout. Stiles shall be 3-1/2-inches wide at centers and 5-1/2-inches wide at ends. Center rails shall be 2-9/16" minimum, and top and bottom rails shall be 5-1/2" wide. Door shall be furnished with rubber weatherstrip at bottom. Door panels shall be 1/4-inch thick exterior grade plywood. Provide fixed glazed openings in door as indicated on drawings, and glaze with double-strength, B quality, clear glass bedded in elastic glazing compound. Counter balancing hardware shall be torsion-spring type on cross header steel shaft. All metal parts such as tracks, guides, bracing and hardware shall be furnished with the door to complete the installation. Tracks shall be 2-inch size and furnished for a 10-inch maximum head radius with adjustable jamb brackets on the verticals. All metal parts shall be galvanized steel. Door sections shall be hinged at rail center stile and end stile. Door shall be erected in accordance with manufacturer's instructions.

(4) Fittings, Hanging and Trimming. - The contractor shall set, fit, and hang all doors including combination storm and screen doors. Swing doors shall have 1/16-inch clearance at side and top and 3/8-inch clearance at the bottom, and shall be hung and trimmed with hardware as specified. Screens shall be fitted and made insect tight.

j. Blocking. - Wood blocking and strapping shall be furnished as indicated or required for proper support or attachment of other items of work.

18-06. LABORATORY EQUIPMENT. - a. Table. - Table shall be 30 inches high, shall be metal equipped with four drawers, and shall be constructed with sturdy metal tank.

b. Sink. - One single stainless steel sink, connected to trap and drain line. Drain line shall be carried outside the building to natural drain. Drain line shall be so constructed that fine-grained soils and cement may be washed down drain without plugging the system. Sink shall be provided with one cold water faucet. The contractor shall mount a 100-gallon tank outside the building to provide water supply for sink, and shall fill tank as required. The sink trap shall conform to Federal Specification WW-P-541b, No. 106 trap.

c. Tank. - The tank shall be a curing tank and constructed of 14-gage galvanized sheet metal reinforced to perform satisfactorily. The tank shall be equipped with drainage plugs, electric stirrer and immersion heater, thermostatically controlled which will maintain a constant uniform water tempeature between 68°F and 78°F. All necessary electric outlets and services for operation of stirrer and heater shall be supplied.

18-07. PAINTING. - a. General. - The contractor shall paint all exterior woodwork, including door and window frames, siding, window sills, and trim, and door butts. Painting shall include both sides of swing and overhead doors. No interior painting is required.

b. Materials. -

Prime coat - Fed. Spec. TT-P-25a & Am-1.

Finish coats - Fed. Spec. TT-P-102a, Class B, light tints; TT-P-53c & Am-1, yellow; TT-P-81d other medium colors.

Color shall be selected by Contracting Officer from color chips submitted by contractor. Two colors shall be required; one for siding, and the other for doors, windows and trim. Paint will be accepted on the basis of certificates of compliance.

c. Workmanship. - The contractor shall apply one prime coat and two finish coats to all surfaces required to be painted. Paint shall be applied in accordance with manufacturer's instructions and as specified in the applicable Federal Specifications.

18-08. ELECTRICAL WORK. - a. The contractor shall provide a temporary service to the building. The building shall be provided with a 120/240 volts, 100-amp, single phase, 3-wire, electric system and a telephone service. The telephone shall be located where directed.

b. The contractor shall provide a 7-1/2 KW unit heater. Lighting fixtures shall be commercial fluorescent type. Each receptacle shall be on a separate circuit. Lighting shall be controlled by switch near door.

c. All electrical work shall conform to the National Electrical Code and any applicable local and utility regulations.

18-09. BUILDERS' HARDWARE. - a. General. - Builders' hardware shall be furnished and installed as required by the specifications. All items of builders' hardware shall be carefully fitted and securely attached. Care shall be exercised not to mar or injure other new work. Upon completion of the work, the contractor shall, in the presence of the Contracting Officer, show that all hardware works in perfect order, shall fit all keys in their respective locks, and upon acceptance of the work shall tag and deliver all keys to the Contracting Officer. Oilite bearing butts may be furnished in lieu of ball bearing butts at option of contractor.

b. Lock Sets. - Lock sets shall embody locking mechanism herein specified and trim conforming to the design specified. Where the exact types of hardware specified are not adaptable to the finished shape or size of members requiring the hardware, suitable types having as nearly as practicable the same operation and quality as type specified shall be furnished. Locks shall have beveled, rounded or rabbeted faces where required. Solid or wrought bronze knobs shall be installed on the exterior door.

c. Materials. - Materials, unless otherwise specified, shall conform to the applicable requirements of the following Federal Specifications:

FF-H-106a	Hardware, Builders; Locks and Door Trim
FF-H-111a	Hardware, Builders; Shelf and Miscellaneous
FF-H-116c	Hinges, Hardware, Builders
FF-H-121c	Hardware, Builders; Door Closing Devices

Hardware for the various items shall conform to the requirements set forth below:

Double-Hung Windows

2 sash Balances	Type F1245
1 Fastener	Type 1140
2 Sash Lifts	Type 1212

Window Screens (for Double-Hung Windows)

Sash Lift	Type 1212 - 2 each screen

Overhead Door

Hardware as recommended by door manufacturer for type of door specified. Door shall be provided with a locking device which provides for operations from both sides of door with cylinder lock and key from exterior.

Exterior Door

3 Butts - 4-1/2 x 4-1/2	Type 2107 x USP
1 Lock and Lock Set	Type 161A-4

d. Key. - Each cylinder lock shall be spin tumbler type and shall be provided with three keys. All locks shall be keyed alike. All keys shall be stamped with the change number.

e. Finish. - Hardware for exterior face of exterior door and window sash, unless otherwise specified, shall be dull bronze; US-10. All butts shall have a priming coat for painting.

18-10. ROOFING. - Thick butt asphalt strip shingles conforming to Federal Specification SS-S-298 or uniform thickness shingles conforming to Federal Specification SS-S-300, type II, shall be applied by workmen skilled at the trade and shall be laid in accordance with the manufacturer's specifications. Shingles shall be 3 tab, and except at ridges, shall be 12-inches by 36-inches. Colors shall be selected from manufacturers' standard color range by the Contracting Officer. Shingles shall be laid with wood shingle starter course, with all courses not more than 5-inches to the weather. A layer of asphalt saturated felt shall be nailed on the sheathing prior to application of shingles.

18-11. SHADES. - a. General. - Shades shall be installed on all windows.

b. Materials. - Materials shall conform to the following Federal Specifications.

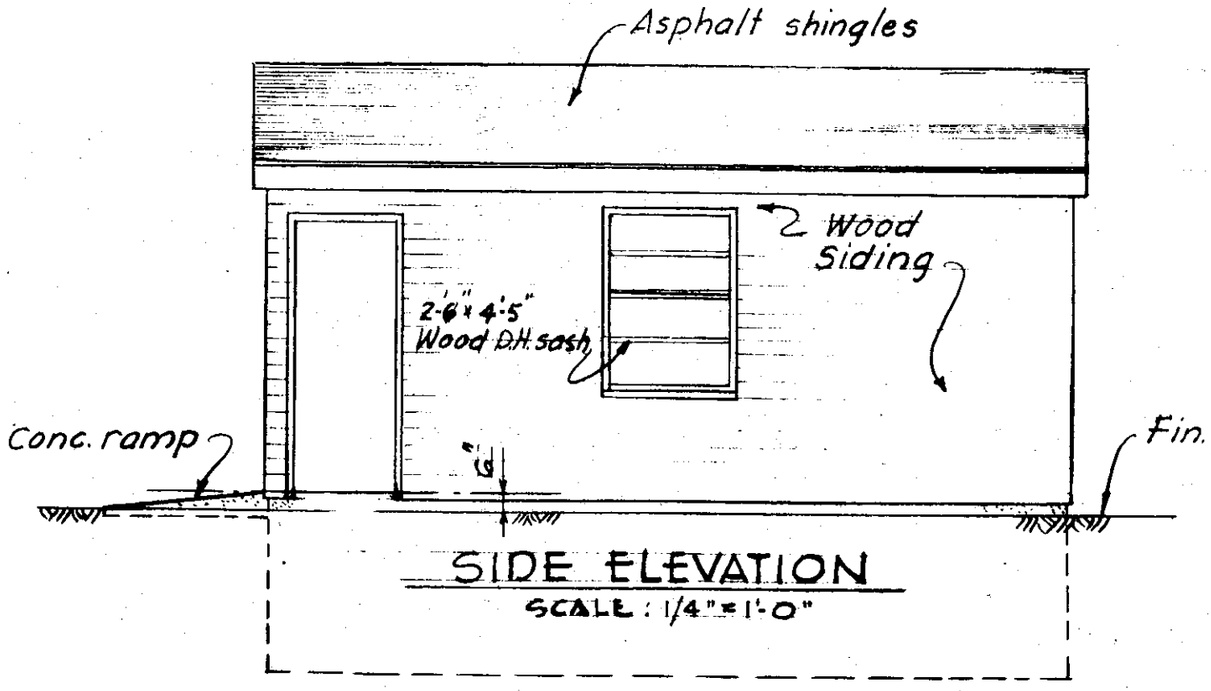
DDD-S-251b for "Shades, Windows; Rollers, Slats, Cords, and Accessories".

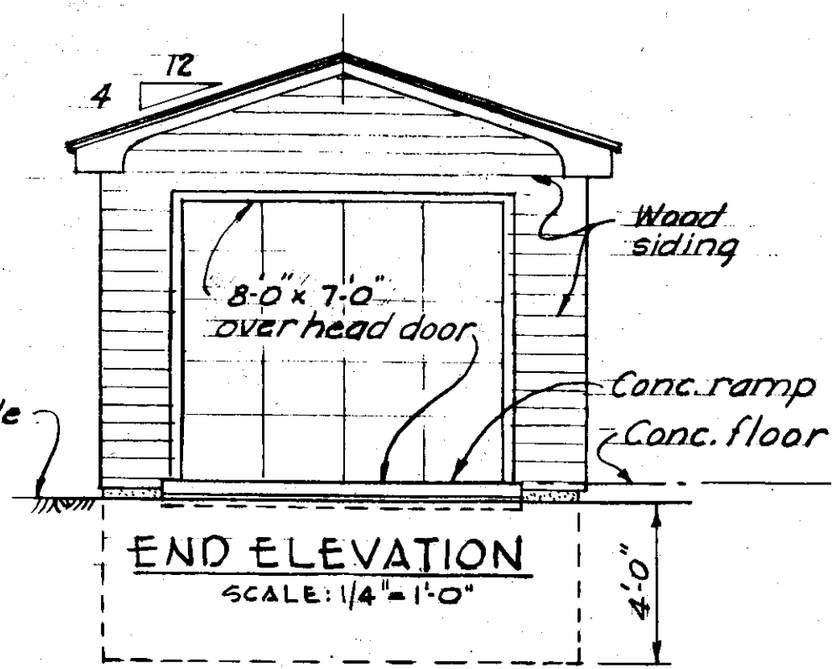
CCC-C-521b for "Cloth; Window Shade", type II or III. Brackets may be malleable iron, stamped steel, or brass, with a brass, copper, nickel, or chromium finish.

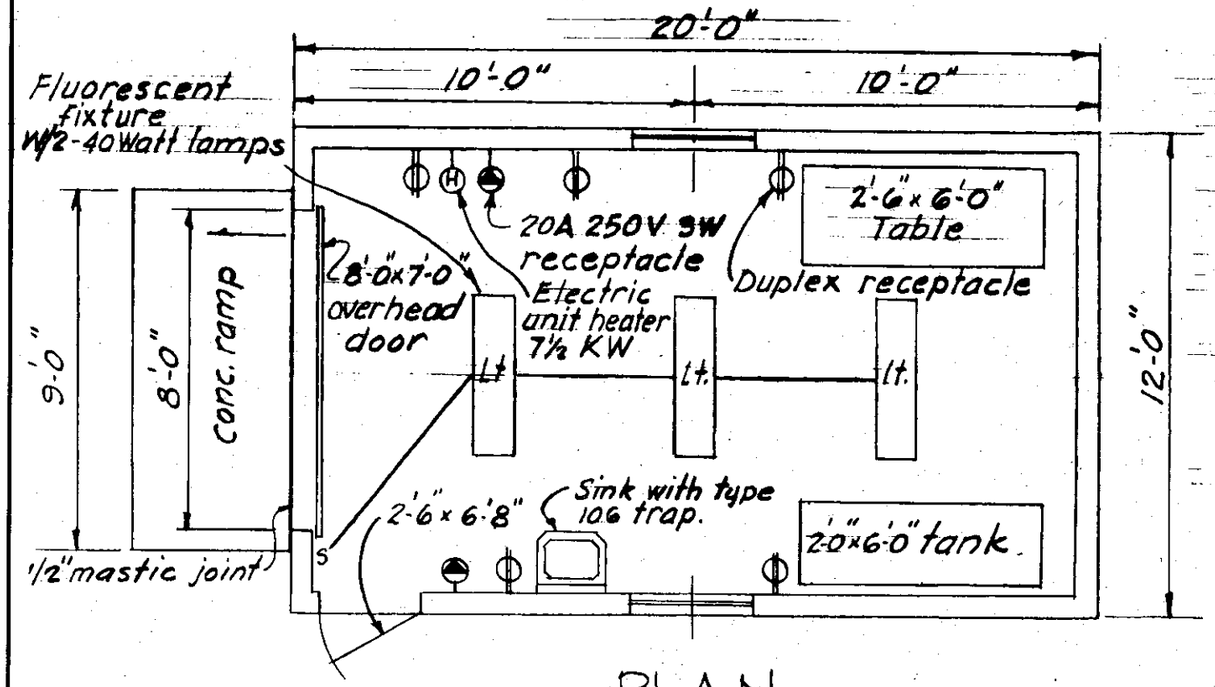
c. Installation. - Shades shall be installed in accordance with the manufacturer's instructions. Brackets shall be accurately located and

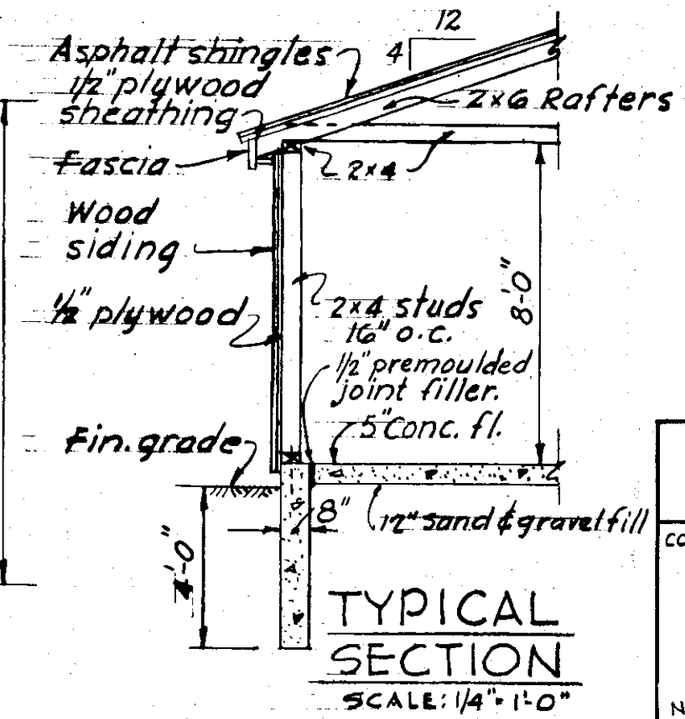
solidly fastened in place, care being taken not to mar or damage existing work. The contractor shall operate all shades in the presence of the Contracting Officer before final acceptance.

18-12. PAYMENT. - Payment for all work specified herein will be made at the lump sum contract price for Item 45, "Storage Building", and will include all costs for grading, earth and rock excavation for foundations, backfilling, fill, electrical and plumbing, and concrete.









U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

CONNECTICUT RIVER FLOOD CONTROL PROJECT

NORTHFIELD BROOK DAM STORAGE BUILDING

PLAN, ELEVATIONS & SECTION

NORTHFIELD BROOK CONNECTICUT

SKETCH # HC-1-1696 DATE: MAR. 1963

Item No.	Description	Quantity	Unit	Price	Estimated Amount
29	Concrete-Spillway-Wall Lining, Retaining Wall and Weir	650	C.Y.	$_____	$_____
30	Cement	3,000	Bbl.	_____	_____
31	Steel Reinforcement	20,000	Lb.	_____	_____
32	Pipe Conduit	1	Job	L.S.	_____
33	Sluice Gate-2' x 3'	1	Job	L.S.	_____
34	Sluice Gate-3' x 3'	1	Job	L.S.	_____
35	Air Vent	1	Job	L.S.	_____
36	Bubble Gage Shelter	1	Job	L.S.	_____
37	Chain Link Fencing	2,500	L.F.	$_____	_____
38	Gates, Double Chain Link	3	Ea.	_____	_____
39	Log Boom	1	Job	L.S.	_____
40	Staff Gages	1	Job	L.S.	_____
41	Miscellaneous Metal Items-Intake Structure	1	Job	L.S.	_____
42	Bituminous Concrete Pavement	1	Job	L.S.	_____
43	Wood Stop Logs	1	Job	L.S.	_____
44	Service Road	1	Job	L.S.	_____
45	Storage Building	1	Job	L.S.	_____
				TOTAL	$_____

NOTES: 1. The work will be awarded as a whole to one bidder.

2. The bidder shall indicate below the type of cement he proposes to furnish (See Paragraph 9-02). One option only will be elected.

Portland Cement /___/

Portland Blast Furnace Slag Cement /___/

3. Only quantities for items with an asterisk adjacent to Item No. are subject to the provisions of Subparagraphs SC-7a and SC-7c of the SPECIAL CONDITIONS.

Serial No. CIVENG-19-016-63-56

HOUSATONIC RIVER FLOOD CONTROL PROJECT

SPECIFICATIONS

FOR

CONSTRUCTION

OF

NORTHFIELD BROOK DAM

AND

APPURTENANT STRUCTURES

NORTHFIELD BROOK, CONNECTICUT

15 March 1963

These facilities were designed by NED

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND

CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS

NED NEW ENGLAND DIVISION

Wear Your HARD HAT

"a little care makes mishaps rare"

The Head You Save WILL BE YOUR OWN

U.S. ARMY CORPS OF ENGINEERS

TABLE OF CONTENTS

STANDARD FORM 20
JANUARY 1961 EDITION
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.401

REFERENCE

Serial No. CIVENG-19-016-63-56

INVITATION FOR BIDS
(CONSTRUCTION CONTRACT)

DATE

15 March 1963

NAME AND LOCATION OF PROJECT

CONSTRUCTION OF NORTHFIELD BROOK DAM AND APPURTENANT STRUCTURES, NORTHFIELD BROOK, CONNECTICUT

DEPARTMENT OR AGENCY

Department of the Army
Corps of Engineers

BY *(Issuing office)*

Division Engineer
U. S. Army Engineer Division, New England
424 Trapelo Road
Waltham 54, Mass.

Sealed bids in duplicate for the work described herein will be received until 2:00 p.m., E.S.T., 16 April 1963

at the address of the Division Engineer, U. S. Army Engineer Division, New England, 424 Trapelo Road, Waltham 54, Mass.

and at that time publicly opened.

Information regarding bidding material, bid guarantee, and bonds

1. Bids may be mailed to: The Division Engineer, U. S. Army Engineer Division, New England, 424 Trapelo Road, Waltham 54, Mass.

2. In lieu of mailing, bids may be delivered in advance to: The Bids Receiving Desk, Building 1098 at the above address. Just prior to the bid opening, bids may be delivered directly to the Contracting Officer in Building 126 (Theater).

3. Bids will be opened at: Building 126 (Theater), 424 Trapelo Road, Waltham 54, Mass.

4. Bids shall be submitted on Standard Form 21 (Bid Form Construction Contract) and shall be prepared in accordance with Standard Form 22 (Instructions to Bidders). The bidder who is awarded the contract will be required to execute the standard contract form for construction contracts (Standard Form 23) attached hereto with Standard Form 23A, General Provision, and supplement thereto, which set forth the contract clauses.

5. Bid guarantee as hereinafter specified in a penal sum of 20% of the bid price or $3,000,000, whichever is the lesser, will be required if the bid price is in excess of $2,000. If Standard Form 24 is submitted, the bid bond penalty may be expressed in terms of a percentage of the bid price or may be expressed in dollars and cents.

Description of work The work consists of furnishing all plant, labor, materials, and equipment and performing all work in strict accordance with the specifications, drawings and schedules for the construction of Northfield Brook Dam and Appurtenant Structures, Northfield Brook, Conn., as follows:

Specifications entitled: "CONSTRUCTION OF NORTHFIELD BROOK DAM AND APPURTENANT STRUCTURES, NORTHFIELD BROOK, CONNECTICUT

Drawings as listed in Paragraph SC-3 of these specifications.

Schedules as set forth in the Bid Form

BIDS MUST SET FORTH FULL, ACCURATE, AND COMPLETE INFORMATION AS REQUIRED BY THIS INVITATION FOR BIDS, INCLUDING ATTACHMENTS. THE PENALTY FOR MAKING FALSE STATEMENTS IN BIDS IS PRESCRIBED IN 18 U.S.C. 1001 (ICB)

READ THE FOLLOWING IN CONJUNCTION
WITH INSTRUCTIONS TO BIDDERS
(U.S. STANDARD FORM 22)

SUPPLEMENT TO INVITATION FOR BIDS
(Construction Contract)

1. Each bidder shall furnish a list of the plant available to the bidder and proposed for use on the work.

2. Bidders are required to acknowledge receipt of all amendments to this invitation on the Bid Form (Standard Form 21) in the space provided, or by separate letter or telegram prior to opening of bids. Failure to acknowledge all amendments may cause the bid to be considered not responsive to the invitation, which would require rejection of the bid.

3. If the bidder, by checking the appropriate box provided therefor in this bid, has represented that he has employed or retained a company or person (other than a full-time bona fide employee working solely for the bidder) to solicit or secure his contract, he may be requested by the Contracting Officer to furnish a completed Standard Form 119, "Contractor's Statement of Contingent or Other Fees for Soliciting or Securing Contract". If the bidder has previously furnished a completed Standard Form 119 to the office issuing this Invitation for Bids, he may accompany his bid with a signed statement, (a) indicating when such completed form was previously furnished, (b) identifying by number the previous invitation for bids or contract, if any, in connection with which such form was submitted, and (c) representing that the statements in such previously furnished form are applicable to this bid.

4. Modifications Prior to Date Set for Opening Bids. - The right is reserved, as the interest of the Government may require, to revise or amend the specifications and/or drawings prior to the date set for opening bids. Such revisions and amendments, if any, will be announced by an amendment or amendments to this Invitation for Bids. Copies of such amendments as may be issued will be furnished to all prospective bidders. If the revisions and amendments are of a nature which require material changes in quantities or prices bid or both, the date set for opening bids may be postponed by such number of days as in the opinion of the Division Engineer will enable bidders to revise their bids. In such cases, the amendment will include an announcement of the new date for opening bids.

5. The Government further reserves the right to make award on any or all schedules of any bid, unless the bidder qualifies such bid by specific limitation; also to make award to the bidder whose aggregate bid on any combination of bid schedules is low. For the purpose of this Invitation for Bids, the word "item", as used in paragraph 10(c) of Standard Form 22, shall be considered to mean "schedule".

6. Repeal of Federal Transportation Tax on Property. - Section 4, Tax Rate Extension Act of 1958, (Act 30 June 1958, Public Law 85-475), in Part repealed the Federal excise tax on the transportation of property effective with respect to amounts paid for such transportation on and after August 1958.

READ THE FOLLOWING IN CONJUNCTION
WITH INSTRUCTIONS TO BIDDERS
(U. S. STANDARD FORM 22)

SUPPLEMENT TO INVITATION FOR BIDS
(Construction Contract)

Accordingly, any bid price(s) submitted hereunder which include freight charges should exclude any amount(s) for Federal excise tax on the transportation of property.

Wherein these instructions conflict with Clause 35 "Federal, State and Local Taxes", of the Supplement to General Provisions (Construction Contracts) S.F. 32A, March 1952 Edition, these instructions will govern.

7. Notice Regarding Buy American Act (Sep. 1962). - a. The Department of Defense has changed its Buy American Act rules. Generally speaking, exception from the Buy American Act will be permitted only in the case of nonavailability of domestic construction materials. A bid or proposal offering nondomestic construction material will not be accepted unless specifically approved by the Office of the Secretary of Defense.

b. Where it is proposed to furnish nondomestic construction material, bids or proposals shall set forth an itemization of the quantity, unit price, and intended use of each item of such nondomestic construction material. When offering nondomestic construction material pursuant to this paragraph, bids or proposals may also offer, at stated prices, any available comparable domestic construction material, so as to avoid the possibility that failure of a nondomestic construction material to be acceptable under this paragraph will cause rejection of the entire bid.

8. Affiliated Bidders. - a. Business concerns are affiliates of each other when either directly or indirectly (i) one concern controls or has the power to control the other, or (ii) a third party controls or has the power to control both.

b. Each bidders shall submit with his bid an affidavit containing information as follows:

(i) whether the bidder has any affiliates;

(ii) the names and addresses of all affiliates of the bidder; and

(iii) the names and addresses of all persons and concerns exercising control or ownership of the bidder and any or all of his affiliates, and whether as common officers, directors, stockholders holding controlling interest, or otherwise.

READ THE FOLLOWING IN CONJUNCTION
WITH INSTRUCTIONS TO BIDDERS
(U. S. STANDARD FORM 22)

SUPPLEMENT TO INVITATION FOR BIDS
(Construction Contract)

9. Parent Company Affidavit. - Bidders must execute the affidavit attached to and forming a part of the Bid Form furnishing information as to Parent Company and Employer Identification Number and submit one executed copy with the bid if the amount of the bid exceeds $10,000. This requirement is in addition to the information required under the provisions of the Affiliated Bidders clause above which information is required regardless of the amount of the bid.

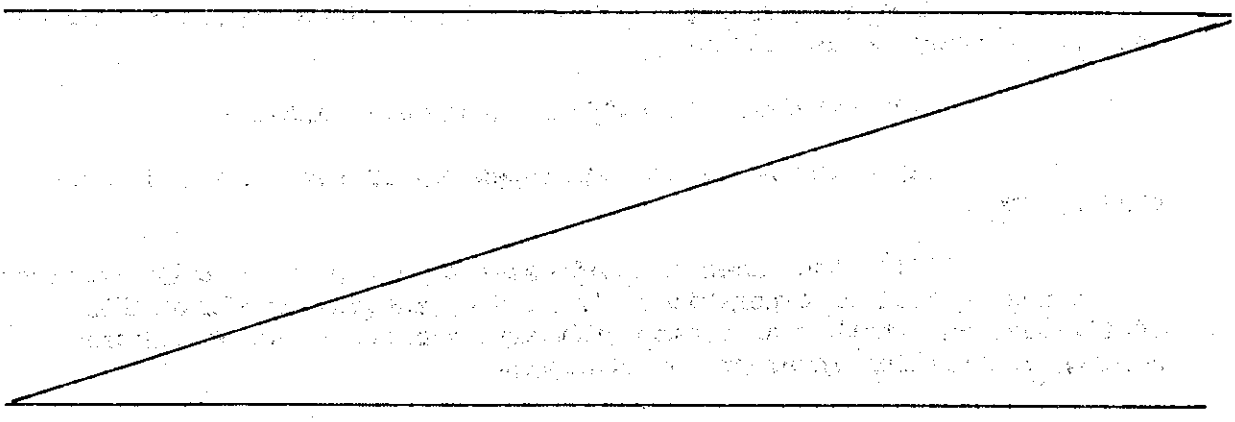
10. Notice of Small Business Set-Aside (Nov. 1961). - a. Restriction. Bids under this invitation are solicited from small business concerns only and this invitation is to be awarded only to one or more small business concerns. This action is based on a determination by the Contracting Officer, alone or in conjunction with a representative of the Small Business Administration, that it is in the interest of maintaining or mobilizing the Nation's full productive capacity, in the interest of war or national defense programs, or in the interest of assuring that a fair proportion of government procurement is placed with small business concerns. Bids or proposals received from firms which are not small business concerns shall be considered nonresponsive.

b. Definitions. - A "small business concern" is a concern that:

(i) is independently owned and operated;

(ii) is not dominant in its field of operation; and

(iii) the average annual receipts of the concern and its affiliates for the preceding three years are $7,500,000 or less.



READ THE FOLLOWING IN CONJUNCTION
WITH INSTRUCTIONS TO BIDDERS
(U.S. STANDARD FORM 22)

SUPPLEMENT TO INVITATION FOR BIDS
(Construction Contract)

11. Sets of drawings, full-size or reduced to half-size, and of specifications will be furnished upon receipt of payment of $10.00 per set for full size drawings and $3.30 for half size drawings. If individual plan sheets are requested, they will be furnished at the rate of $0.50 for full-size sheet and $0.10 for half-size sheet for each sheet requested, but with a minimum charge of $1.00 except as provided for below. No refund of the payment for drawings will be made and the drawings need not be returned to the Division Engineer. Additional copies of the specifications alone will be furnished an applicant at the rate of $1.00 per copy. Payments will be made by cash, check, or money order and delivered to the Finance and Accounting Officer, Corps of Engineers, Department of the Army, 424 Trepelo Road, Waltham, Mass. Checks and money orders should be made payable to "Treasurer of the United States". If the project is cancelled or no award is made under the invitation, upon request, refund of the payment for the plans and specifications will be made thereon upon return thereof to the issuing office, all charges prepaid.

12. Technical inquiries regarding the plans and specifications during the bidding period shall be made to the following:

Mr. Philip P. Thoresen, Waltham, Mass., TWinbrook 4-2400, Ext. 263.

13. The value of work involved is approximately $1,000,000.

14. The Government reserves the right to award a contract under this invitation notwithstanding the expiration of wage rate determination of the Secretary of Labor set forth in SC-6. If the wage rate determination has expired (29 CFR 5.4 (a)) a new wage rate determination may be substituted for the expired determination and award made on the basis of the bid as submitted without a change in the bid price.

15. CAUTION TO BIDDERS-LATE BIDS. - See Standard Form 22, "Instructions to Bidders", for the special provision entitled "Late Bids and Modifications or Withdrawals" which provides that late bids and modifications or withdrawals thereof sent through the mails will be considered ONLY IF SENT BY REGISTERED MAIL, OR BY CERTIFIED MAIL FOR WHICH A POSTMARKED RECEIPT HAS BEEN OBTAINED AS SPECIFIED IN SUCH PROVISION. (APR. 1962).

16. Reverse Signal Alarms are required in accordance with Par. SC-30.

READ THE FOLLOWING IN CONJUNCTION
WITH INSTRUCTIONS TO BIDDERS
(U.S. STANDARD FORM 22)

SUPPLEMENT TO INVITATION FOR BIDS
(Construction Contract)

17. Performance of Work by Contractor (Par. SC-34). - Each bidder shall submit on the attached form, a description of the work which he will perform with his own organization (e.g., earthwork, paving, concrete, etc.), the percentage of the total work this represents, and the estimated cost thereof.

18. Safety Requirements. - Paragraph GC-16 of the General Conditions of the proposed specification incorporates and makes a part of the contract the Corps of Engineers Manual, EM 385-1-1, dated 13 March 1958, entitled "General Safety Requirements," as amended. Such requirements will be strictly enforced and adhered to by the contractor. Those bidders who do not have a copy of this manual, or who are not aware of its contents may familiarize themselves with its provisions by contacting the Resident Engineer at the site or by visiting the Division Office in Waltham, Mass. Copies of this manual will be furnished the successful bidder after contract award has been made.

PART I

GENERAL CONDITIONS
(Index)

PART I

GENERAL CONDITIONS

GC-1. SCOPE OF WORK. - The work to be performed under this contract consists of furnishing all plant, materials, equipment, supplies, labor and transportation, including fuel, power, water (except any materials, equipment, utility or service, if any, specified herein to be furnished by the Government), and performing all work as required in the statement of work in the contract, in strict accordance with the specifications, schedules, and drawings, all of which are made a part hereof, and including such detail drawings as may be furnished by the Contracting Officer from time to time during the prosecution of the work in explanation of said drawings.

GC-2. CHARACTER OF WORK AND MECHANICS. - The work shall be executed in the best and most workmanlike manner by qualified, careful and efficient mechanics in strict accordance with the drawings and specifications.

GC-3. SITE INVESTIGATION. - The contractor acknowledges that he has satisfied himself as to the nature and location of the work, the general and local conditions, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, river stages, tides or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment and facilities needed preliminary to and during prosecution of the work. The contractor further acknowledges that he has satisfied himself as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the Government as well as from information presented by the drawings and specifications made a part of this contract. Any failure by the contractor to acquaint himself with the available information will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the work. The Government assumes no responsibility for any conclusions or interpretations made by the contractor on the basis of the information made available by the Government. The Government also assumes no responsibility for any understanding or representations made by its officers or agents during or prior to the execution of this contract, unless (i) such understanding or representations are expressly stated in the contract and (ii) the contract expressly provides that the responsibility therefor is assumed by the Government. Representations which are not expressly stated in the contract and for which liability is not expressly assumed by the Government in the contract shall be deemed only for the information of the contractor.

GC-4. OPERATIONS AND STORAGE AREAS. - a. All operations of the contractor (including storage of materials) upon Government premises shall be confined to areas authorized or approved by the Contracting

Officer. No unauthorized or unwarranted entry upon or passage through, or storage or disposal of materials shall be made upon Government premises. Government premises adjacent to the construction will be made available for use by the contractor without cost whenever such use will not interfere with other Government uses or purposes. The contractor shall be liable for any and all damage caused by him to such Government premises. The contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature or kind arising from any use, trespass or damage occasioned by his operations on premises of third persons.

b. Temporary buildings (storage sheds, shops, offices, etc.), may be erected by the contractor only with the approval of the Contracting Officer, and shall be built with labor and materials furnished by contractor without expense to the Government. Such temporary buildings and/or utilities shall remain the property of the contractor and will be removed by him at his expense upon the completion of the work. With the written consent of the Contracting Officer, such buildings and/or utilities may be abandoned and need not be removed.

c. The contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways or construct and use such temporary roadways as may be authorized by the Contracting Officer. Where materials are transported in the prosecution of the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, state or local law or regulation. When it is necessary to cross curbings or sidewalks, protection against damage shall be provided by the contractor and any damaged roads, curbings, or sidewalks shall be repaired by, or at the expense of the contractor.

GC-5. PROGRESS CHARTS, AND REQUIREMENTS FOR OVERTIME WORK. - a. The contractor shall within 5 days or within such time as determined by the Contracting Officer, after date of commencement of work, prepare and submit to the Contracting Officer for approval a practicable schedule, showing the order in which the contractor proposes to carry on the work, the date on which he will start the several salient features (including procurement of materials, plant and equipment) and the contemplated dates for completing the same. The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion at any time. The contractor shall enter on the chart the actual progress at the end of each week or at such intervals as directed by the Contracting Officer, and shall immediately deliver to the Contracting Officer three copies thereof. If the contractor fails to submit a progress schedule within the time herein prescribed, the Contracting Officer may withhold approval of progress payment estimates until such time as the contractor submits the required progress schedule.

b. If, in the opinion of the Contracting Officer, the contractor falls behind the progress schedule, the contractor shall take

such steps as may be necessary to improve his progress and the Contracting Officer may require him to increase the number of shifts, and/or overtime operations, days of work, and/or the amount of construction plant, and to submit for approval such supplementary schedule or schedules in chart form as may be deemed necessary to demonstrate the manner in which the agreed rate of progress will be regained, all without additional cost to the Government.

c. Failure of the contractor to comply with the requirements of the Contracting Officer under this provision shall be grounds for determination by the Contracting Officer that the contractor is not prosecuting the work with such diligence as will insure completion within the time specified. Upon such determination, the Contracting Officer may terminate the contractor's right to proceed with the work, or any separable part thereof, in accordance with the delays-damages article of the contract.

GC-6. SUBCONTRACTORS. - Within 7 days after the award of any subcontract either by himself or a subcontractor, the contractor shall deliver to the Contracting Officer a statement setting forth the name and address of the subcontractor and a summary description of the work subcontracted. The contractor shall, at the same time, furnish a statement signed by the subcontractor acknowledging the inclusion in his subcontract of Clause 21 of Standard Form 23A and all clauses set forth in Standard Form 19A. If, for sufficient reason, at any time during the progress of the work, the Contracting Officer determines that any subcontractor is incompetent or undesirable, he will notify the contractor accordingly and steps will be taken immediately for cancellation of such subcontract. Subletting by subcontractors shall be subject to the same regulations. Nothing contained in this contract shall create any contractual relation between the subcontractor and the Government.

GC-7. QUALITY OF ARTICLES, MATERIALS AND EQUIPMENT. - a. Where articles, materials and equipment are required to conform to standard specifications or tests of the Government or other authorities incorporated by reference, they will conform to the respective editions, including amendments, specified.

b. Any samples and descriptive data required shall -

(1) Be submitted within the time specified in these specifications or, if not specified, within a reasonable time before use to permit inspection and testing.

(2) Be shipped prepaid and delivered as specified in these specifications, or as directed by the Contracting Officer.

(3) Be marked to show the name of the material, trade name of manufacturer, place of origin, name and location of the project where the material represented by the sample is to be used, and the name of the contractor submitting the sample.

c. Samples not subjected to destructive tests may be retained until completion of the work but thereafter will be returned to the contractor, if he so requests in writing, at his own expense. Failure of any sample to pass the specified requirements will be sufficient cause for refusal to consider further any samples from the same manufacturer whose materials failed to pass the tests.

GC-8. PROTECTION OF MATERIAL AND WORK. - The contractor shall at all times protect and preserve all materials, supplies and equipment of every description (including property which may be Government-furnished or owned) and all work performed. All reasonable requests of the Contracting Officer to inclose or specially protect such property shall be complied with. If, as determined by the Contracting Officer, material, equipment, supplies and work performed are not adequately protected by the contractor such property may be protected by the Government and the cost thereof may be charged to the contractor or deducted from any payments due to him.

GC-9. PROTECTION OF EXISTING STRUCTURES, UTILITIES, WORK AND VEGETATION. - a. Any damage to existing structures or work of any kind, or the interruption of a utility service resulting from failure to comply with the requirements of this contract shall be repaired or restored promptly by or at the expense of the contractor.

b. The contractor will preserve and protect all existing vegetation such as trees, shrubs, and grass on or adjacent to the site which do not unreasonably interfere with the construction as may be determined by the Contracting Officer. The contractor will be responsible for all unauthorized cutting or damaging of trees and shrubs, including damage due to careless operation of equipment, stockpiling of materials or tracking of grass areas by equipment.

c. Care will be taken by the contractor in felling trees authorized for removal to avoid any unnecessary damage to vegetation that is to remain in place. Any limbs or branches of trees broken during such operations, shall be trimmed with a clean cut and painted with an approved tree pruning compound if required by the Contracting Officer. The contractor will be liable for or may be required to replace or restore at his own expense all vegetation not protected and preserved as required herein that may be destroyed or damaged.

GC-10. POSSESSION PRIOR TO COMPLETION. - The Government shall have the right to take possession of or use any completed or partially completed part of the work. Such possession or use shall not be deemed an acceptance of any work not completed in accordance with the contract.

If such prior possession or use by the Government delays the progress of the work or causes additional expenses to the contractor, an equitable adjustment in the contract price and/or the time of completion will be made and the contract shall be modified in writing accordingly.

GC-11. RESERVED

GC-12. LABOR REPORTS. - The contractor shall promptly furnish, and shall cause any subcontractors to furnish in like manner, within 7 days after the regular payment date of each weekly payroll, to the Contracting Officer, a copy of such payroll together with a statement of compliance with respect to the wages paid each of its employees (which shall not be deemed to apply to persons in classifications higher than laborers and mechanics and those who are the immediate supervisors of such employees) engaged on the work. If the contractor or any of his subcontractors fails to furnish copies of such payrolls, the Contracting Officer may disapprove all or part of any progress payment estimate for the period covered by such payrolls until they are received by him. The contractor shall also prepare and furnish such labor reports as may be required by the Department of Labor.

GC-13. CLEANING UP. - The contractor shall, at all times, keep the construction area, including storage areas used by him, free from accumulations of waste material or rubbish and prior to completion of the work remove any rubbish from the premises and all tools, scaffolding, equipment, and materials not the property of the Government. Upon completion of the construction, the contractor shall leave the work and premises in a clean, neat and workmanlike condition satisfactory to the Contracting Officer.

GC-14. DEFINITIONS. - a. Wherever in the specifications or upon the drawings the words directed, required, ordered, designated, prescribed, or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation or prescription of the Contracting Officer is intended and similarly the words approved, acceptable, satisfactory or words of like import shall mean approved by, or acceptable to, or satisfactory to the Contracting Officer, unless otherwise expressly stated.

b. Basic rate as used in Clause 2, "Work Hours Act of 1962 - Overtime Compensation", of Standard Form 19A means the basic hourly straight time wage rate actually paid laborers and mechanics and is not necessarily the same as the minimum hourly rate referred to in Clause 1, "Davis-Bacon

Act" of Standard Form 19A and in the paragraph of the specifications entitled "Rates of Wages".

GC-15. BONDS. - a. Payment Bond. - If the contract exceeds $2,000, the contractor agrees to furnish a payment bond with good and sufficient surety or sureties acceptable to the Government for the protection of persons furnishing material or labor in connection with the performance of the work under this agreement on U. S. Standard Form No. 25-A or U. S. Standard Form No. 27-A. The penal sum of such payment bond will be as follows: (1) When the contract price is $1,000,000 or less, 50 percent of the contract price; (2) When the contract price is in excess of $1,000,000, but no more than $5,000,000, 40 percent of the contract price; (3) When the contract price is more than $5,000,000, $2,500,000.

b. Performance Bond. - If the contract price exceeds $2,000, the contractor further agrees to furnish a performance bond with good and sufficient surety or sureties acceptable to the Government in connection with the performance of the work under this agreement on U. S. Standard Form No. 25 or U. S. Standard Form No. 27. The penal sum of such performance bond will be 100 percent of the contract price.

c. Any bonds required hereunder will be dated as of the same date as the contract and will be furnished by the contractor to the Government at the time the contract is executed.

GC-16. ACCIDENT PREVENTION. - a. In order to provide safety controls for protection to the life and health of employees and other persons; for prevention of damage to property, materials, supplies, and equipment; and for avoidance of work interruptions in the performance of this contract; the contractor will comply with all pertinent provisions of Corps of Engineers Manual, EM 385-1-1, dated 13 March 1958, entitled "General Safety Requirements," as amended, and will also take or cause to be taken such additional measures as the Contracting Officer may determine to be reasonably necessary for the purpose.

b. Prior to commencement of work, the contractor will -

(1) Submit in writing his proposals for effectuating this provision for Accident Prevention.

(2) Meet in conference with representative of the Contracting Officer to discuss and develop mutual understandings relative to administration of the over-all safety program.

c. During the performance of work under the contract, the contractor shall comply with all procedures prescribed by the Contracting

Officer for the control and safety of persons visiting the job site and will comply with such requirements to prevent accidents as may be specified under the SPECIAL CONDITIONS of these specifications or issued by the Contracting Officer.

d. The contractor will maintain an accurate record of, and will report to the Contracting Officer in the manner and on the forms prescribed by the Contracting Officer, exposure data and all accidents resulting in death, traumatic injury, occupational disease, and/or damage to property, materials, supplies and equipment incident to work performed under this contract.

e. The Contracting Officer will notify the contractor of any non-compliance with the foregoing provisions and the action to be taken. The contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the contractor or his representative at the site of the work, shall be deemed sufficient for the purpose. If the contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop order shall be made the subject of claim for extension of time or for excess costs or damages by the contractor.

f. Compliance with the provisions of this article by subcontractors will be the responsibility of the contractor.

GC-17. INSPECTION. - The work will be conducted under the general direction of the Contracting Officer and is subject to inspection by his appointed inspectors to insure strict compliance with the terms of the contract. No inspector is authorized to change any provision of the specifications without written authorization of the Contracting Officer, nor shall the presence or absence of an inspector relieve the contractor from any requirements of the contract. As soon as practicable after the completion of the entire work, or any divisible part thereof as may be designated in these specifications, a thorough examination thereof will be made by the Contracting Officer at the site of the work. If such work is found to comply fully with the requirements of the contract, it will be accepted; and final payment therefor will be made in accordance with the article of the contract entitled "Payments to Contractors."

GC-18. ITEMS OF WORK. - A brief description of each item and the estimated quantity thereof are shown in the schedule attached to the Bid Form and listed in the Statement of Work in the contract. Unless otherwise provided in the SPECIAL CONDITIONS, within the limit of available funds, the contractor will be required to complete the work specified herein in accordance with the contract and at the contract price or prices.

PART II

SPECIAL CONDITIONS
(Index)

PART II

SPECIAL CONDITIONS

SC-1. COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK. - a. General. - The contractor will be required to commence work under this contract within 15 calendar days after the date of receipt by him of notice to proceed, to prosecute said work with faithfulness and energy, and to complete the entire work ready for use not later than 750 calendar days after date of receipt by him of notice to proceed. The time stated for completion shall include final clean-up of the premises.

b. Time Extension for Topsoiling and Seeding. - In the event the contract completion date, as established in subparagraph "a" above, is thirty (30) days or more after the lmiting date established for seeding in the Technical Provisions herein, the contract completion date for topsoiling and seeding will be the last date of the next succeeding period specified as acceptable for seeding.

SC-2. OMITTED.

SC-3. CONTRACT DRAWINGS AND SPECIFICATIONS. - Twenty sets of contract drawings (full-size and/or half-size) and specifications will be furnished the contractor without charge, except for applicable publications incorporated into the Technical Provisions by reference. Additional sets will be furnished on request at the cost of reproduction. The work shall conform to the following contract drawings, all of which form a part of these specifications and are available in the office of the U. S. Army Engineer Division, New England, 424 Trapelo Road, Waltham, Massachusetts.

Drawing No.	Sheet No.	Title	Rev. No.
HC-1-1695	1	Project Location and Index	
HC-1-1695	2	Reservoir Map and Limit of Contractor's Work Area	
HC-1-1695	3	General Plan	
HC-1-1695	4	Dam Embankment - Profiles and Details	
HC-1-1695	5	Dam Embankment - Sections	
HC-1-1695	6	Outlet Works - Plan, Profile and Sections	
HC-1-1695	7	Outlet Works - Inlet Structure-Concrete Details No. 1	
HC-1-1695	8	Outlet Works - Inlet Structure-Concrete Details No. 2	
HC-1-1695	9	Outlet Works - Conduit-Plan and Profile	
HC-1-1695	10	Outlet Works - Conduit-Sections	
HC-1-1695	11	Outlet Works - Outlet Structure-Concrete Details	
HC-1-1695	12	Outlet Works - Inlet Structure-Steel Reinforcement	

Drawing No.	Sheet No.	Title	Rev. No.
HC-1-1695	13	Outlet Works - Miscellaneous Details	
HC-1-1695	14	Outlet Works - Sluice Gates-Plans, Sections and Details	
HC-1-1695	15	Spillway - Profile and Sections	
HC-1-1695	16	Spillway - Concrete Details No. 1	
HC-1-1695	17	Spillway - Concrete Details No. 2	
HC-1-1695	18	Bubble Gate Shelter-Details	
HC-1-1695	19	Bubble Gage Shelter-Steel Reinforcement	
HC-1-1695	20	Log Boom, Staff Gages & Miscellaneous Details	
HC-1-1695	21	Service Road - Plan, Profile and Sections	
HC-1-1695	22	Plaque - Sections and Details	
HC-2-1033	23	Plan of Foundation Explorations	
HC-2-1033	24	Dam - Geologic - Log Sections	
HC-2-1033	25	Spillway - Geologic - Log Sections	
HC-2-1033	26	Outlet Conduit - Geologic-Log Sections	
HC-2-1033	27	Record of Foundation Explorations No. 1	
HC-2-1033	28	Record of Foundation Explorations No. 2	
HC-2-1033	29	Plan of Borrow Explorations	
HC-2-1033	30	Record of Borrow Explorations No. 1	
HC-2-1033	31	Record of Borrow Explorations No. 2	
HC-3-1027	32	Hydrographs 1930-1949 - Leadmine Brook, Connecticut	
HC-3-1027	33	Hydrographs 150-1961 - Leadmine Brook, Connecticut	

SC-4. SHOP DRAWINGS. - The contractor shall submit to the Contracting Officer for approval seven (7) copies of all shop drawings as called for under the various headings of these specifications. These drawings shall be complete, shall be checked by the contractor prior to submission, and shall contain all required detailed information. If approved by the Contracting Officer, each copy of the drawings will be identified as having received such approval by being so stamped and dated. The contractor shall make any corrections required by the Contracting Officer. Five (5) sets of all shop drawings will be retained by the Contracting Officer and two sets will be returned to the contractor. The approval of the drawings by the Contracting Officer shall not be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory. Approval of such drawings will not relieve the contractor of the responsibility for any error which may exist, as the contractor shall be responsible for the dimensions and design of adequate connections, details and satisfactory construction of all work. (See Par. SC-50, DEVIATIONS FROM CONTRACT REQUIREMENTS.) The submission by the contractor will be accompanied by ENG Form 4025, in seven copies. In addition, an information copy of this form, without inclosures, will be forwarded by the contractor to the Resident Engineer, Area Engineer, and Design Branch, Engineering Division, NED. ENG Form 4025 will be furnished to the contractor by the Government.

SC-5. PHYSICAL DATA. - Information and data furnished or referred to below are furnished for information only and it is expressly understood that the Government will not be responsible for any interpretation or conclusion drawn therefrom by the contractor.

a. Physical Conditions. - The physical conditions indicated on the drawings and in the specifications are the result of site investigations by surveys, borings, and test pits. Soil samples and rock cores obtained from the subsurface explorations made by the Government, field reports of explorations, records of water levels in observation wells, and results and data of all tests made by the Government on soil samples are available for examination and review at the Corps of Engineers, Foundations and Materials Branch, New England Division Headquarters, 424 Trapelo Road, Waltham, Mass., telephone TWinbrook 4-2400, Ext. 387. The results of laboratory tests, performed on soil samples obtained from subsurface explorations in the foundation areas of the embankments and structures and in the Borrow Area are shown on Plate Nos. A1 through A7, inclusive, inserted at the end of the SPECIAL CONDITIONS. The classification of soil samples is in accordance with Drawing No. NEDGL-61-5C, "Unified Soil Classification", attached at the end of the SPECIAL CONDITIONS.

b. Weather Conditions. - Weather conditions at the site of the work are approximately as indicated below. Complete weather records and reports may be obtained from the U. S. Weather Bureau. On the basis of records, the following weather information is listed for the convenience of the contractor:

MONTHLY TEMPERATURES
(Degrees Fahrenheit)

	Norfolk, Conn. Elevation 1,380 ft., m.s.l. 15 Yrs. of Record			Waterbury, Conn. Elevation 340 ft., m.s.l. 69 Yrs. of Record		
Month	Mean	Maximum	Minimum	Mean	Maximum	Minimum
January	22.3	62	-22	28.1	73	-19
February	23.6	66	-15	28.3	70	-25
March	29.8	77	-11	37.1	87	0
April	43.7	82	6	48.4	92	11
May	53.9	85	25	59.4	96	26
June	62.7	91	34	68.0	101	33
July	67.8	92	41	72.9	105	41
August	65.8	93	38	70.8	104	35
September	58.4	93	26	64.1	103	25
October	48.6	79	20	53.5	94	17
November	38.0	73	5	42.3	84	2
December	25.4	60	-12	31.1	70	-12
Annual	45.0	93	-22	50.3	105	-25

MONTHLY PRECIPITATION RECORD
(In Inches)

	Norfolk, Conn. Elevation 1,380 ft. m.s.l. 15 Yrs. of Record			Waterbury, Conn. Elevation 340 ft., m.s.l. 69 Yrs. of Record		
Month	Mean	Maximum	Minimum	Mean	Maximum	Minimum
January	4.25	8.32	0.93	3.84	10.06	0.84
February	3.75	25.90	1.11	3.53	10.00	0.43
March	5.00	10.37	1.82	4.07	9.46	0.17
April	4.75	7.19	2.48	3.72	11.51	9.66
May	3.98	6.26	1.70	3.90	8.08	0.13
June	3.91	6.83	1.11	3.57	11.25	0.54
July	4.01	6.86	1.67	4.39	18.10	1.34
August	5.02	23.67	0.65	4.26	9.48*	0.90
September	4.39	9.25	0.92	3.72	12.90	0.90
October	4.44	17.49	1.73	3.49	8.83*	0.20
November	5.14	10.03	1.27	3.83	8.74	0.78
December	5.00	9.56	1.20	3.88	9.82	0.82
Annual	53.7	74.67	39.44	46.20	66.58	31.21

* Probably exceeded in 1955.

MEAN MONTHLY SNOWFALL

Norfolk, Conn.
Elevation 1,380 ft., m.s.l.
(Average depth in inches)

Month	Snowfall
January	19.1
February	20.7
March	18.4
April	6.6
May	0.3
June	0
July	0
August	0
September	0
October	0.4
November	6.3
December	12.4
Annual	84.2

Snow cover reaches a maximum depth in late March with the water content in early spring often four to six inches.

c. Transportation Facilities. - (1) Railroads. - The New York, New Haven and Hartford Railroad serves the Thomaston area. The Devon to Winsted Branch of this railroad serves the Naugatuck Valley. There are freight sidings at both Thomaston and Torrington, Conn., with unloading facilities.

(2) Highways. - U.S. Routes 6 and 202 and State Route 8 pass through Thomaston. Access to dam site from Thomaston is over Litchfield Street. It will be the responsibility of the contractor to make his own investigation of transportation facilities including railroads and public roads and private lands and make his own arrangement for their use.

SC-6. RATES OF WAGES. - a. The minimum wages to be paid laborers and mechanics on this project, as determined by the Secretary of Labor to be prevailing for the corresponding classes of laborers and mechanics employed on projects of a character similar to the contract work in the pertinent locality, are as set forth below.

b. Any class of laborers and mechanics not listed below employed on this contract shall be classified or reclassified conformably to the schedule set out below by mutual agreement between the contractor and class of labor concerned, subject to the prior approval of the Contracting Officer. In the event the interested parties cannot agree on the proper classification or reclassification of a particular class of laborers and mechanics to be used, the question, accompanied by the recommendation of the Contracting Officer, shall be referred to the Secretary of Labor for final determination.

(Predetermination No. AB-19,414 dated 13 February 1963 for Construction of Northfield Brook Dam and Appurtenant Structures involving construction of earth and rock-fill dam; reinforced concrete spillway, conduit and gate chambers; site work and construction of a field office, Northfield Brook Dam, Thomaston, Litchfield County, Connecticut)

Classification of Laborers and Mechanics	Minimum Rates of Wages Per Hour
Ironworkers, structural	$ 4.65
" ornamental	4.65
" reinforcing	4.65
Painters, brush	3.25
" structural steel	3.75
Welders - Receive rate prescribed for craft performing operation to which welding is incidental.	

APPRENTICE SCHEDULE

Craft	Interval	Period and Rate* 1st	2d	3d	4th	5th	6th	7th	8th	9th	10th
Painters	Year	50	65	75							
Ironworkers	1000 hrs	60	70	80	90						

*The apprentice rate is by percentage of the journeymen's rate unless otherwise indicated.

Classification of Laborers and Mechanics	Minimum Rates of Wages Per Hour
Heavy and Highway Construction	
Laborers:	
Laborers	$ 2.60
Pavers, rammers, curb setters	3.125
Pipe layers	2.70
Hod carriers and jackhammers	2.75
Wagon drill op.	2.85
Blasters	3.05
Zone I - West of the Housatonic River, plus the township of Milford in New Haven County:	
Carpenters	4.15
Bricklayers, cement masons, stone masons	4.10
Zone II - All of Connecticut East of the Housatonic River, except Milford:	
Carpenters	3.85
Bricklayers, cement masons, stone masons	4.05
Power equipment operators:	
Air compressors	3.37
Air battery	4.00
Asphalt distributor-spreaders	3.85
Asphalt plants	3.45
Backhoes	4.20
Boring machines (rock & earth)	4.00
Bulldozers	3.50
Full floats	3.45
Cranes, derricks, drags	4.20
Concrete batch plants	3.10
Concrete finishing machines	3.45
Concrete paving machines	4.20
Conveyors	4.00
Crushing, screening plants	3.10
Elevating graders	4.20
Erecting, handling steel	4.30
Firemen (high pressure)	3.45
Forklifts	3.45
Gradall (all purpose)	4.20
Loaders, euclid	4.00

Classification of Laborers and Mechanics	Minimum Rates of Wages Per Hour
Heavy & Highway Construction (Continued)	
Power equipment operators:	
Loaders, front-end (3 yds. and over)	$ 3.75
Loaders, front-end (under 3 yds.)	3.45
Mechanics, master	4.20
Mechanics, maintenance-engineer	3.50
Mixers, concrete (under 5 bags)	3.55
Mixers, concrete (5 bags and over)	3.75
Motor graders, patrol	3.65
Oilers, greasers	3.10
Pavement breakers (power)	3.45
Pile drivers	4.20
Post hole diggers	4.00
Power chippers	3.45
Pumps	3.37
Pumpcretes	4.00
Rollers, asphalt	3.60
Rollers, base	3.45
Scrapers, carryalls	3.50
Shovels	4.20
Side booms	4.00
Steel pile sheeting	4.20
Stone spreaders (power)	3.75
Tractors, crawler	3.50
Trenching machines	4.20
Truck cranes	4.20
Welders	3.50
Well points	3.73
Truck Drivers:	
2-axle	2.85
3-axle	2.95
2-axle, ready-mix	2.95
3-axle, ready mix	3.00
Heavy duty trailers:	
Up to 40 tons	3.00
40 tons and over	3.05
Helpers	2.85
Specialized earth moving equipment other than conventional type on the road-trucks, and semitrailers, including Euclids	3.10

c. Health and Welfare Funds. - The wage rates contained in this decision are straight hourly wage rates. In some areas management and labor organizations in the construction industry have collectively bargained for health and welfare fund contributions. Such contributions are not included in wage rates determined by the Secretary of Labor for construction projects.

SC-7. VARIATIONS IN ESTIMATED QUANTITIES. - a. Where the actual quantity of a pay item in this contract which is identified on the Unit Price Schedule with an asterisk is more than 115% or less than 87% of the estimated quantity stated in this contract, as modified, an equitable adjustment in the contract price shall be made upon demand of either party. For overruns the equitable adjustment shall be limited to the number of units by which the actual quantity exceeds 115% of the estimated quantities. Where the actual quantity of any pay item is less than 87% of the estimated quantity stated in this contract, the final payment will be computed by applying the contract unit price to that portion of the work actually performed. For the portion of the work between the work actually performed and 87% of the estimated quantity stated in the contract, the contractor shall be paid an equitable negotiated amount that will exclude profit and include only an appropriate amount for mobilization, demobilization and other fixed changes.

b. In order to permit the contractor to distribute his indirect costs properly to Item No. 24, this item has been subdivided into two or more sub-items. All the contractor's indirect costs for this item will be included in the bid price for the mobilization and demobilization item. Variation from the estimated quantity in the actual work performed under any other sub-item or the elmination of all work under such a sub-item will not be the basis for an adjustment in contract unit price.

c. If actual work performed under any item within the scope of subparagraph a above is more than 105% or less than 96% of the estimated quantity stated in the contract, as modified, and if such variation causes an increase or a decrease in the time required for performance of this contract the contract completion time will be adjusted as follows:

(1) If the quantity variation is such that it will cause an increase in the time necessary for completion, the Contracting Officer shall, upon receipt of a written request for an extension within 10 days from the beginning of such delay or within such further period of time which the Contracting Officer grants prior to the date of final settlement of the contract, ascertain the facts and make such adjustment for extending the completion date as in his judgment the findings justify.

(2) If the quantity variation is such that it will cause a decrease in the time necessary for completion, the Contracting Officer shall ascertain the facts and promptly notify the contractor in writing of his findings and the extent of adjustment.

d. If the parties fail to agree upon the adjustment to be made the dispute shall be determined as provided in Clause 6, "Disputes", of the General Provisions.

SC-8 and SC-9. OMITTED.

SC-10. WATER. - a. The responsibility shall be upon the contractor to provide and maintain at his own expense an adequate supply of water for his use for construction and domestic consumption, and to install and maintain necessary supply connections and piping for same, but only at such locations and in such manner as may be approved by the Contracting Officer. Before final acceptance, temporary connections and piping installed by the contractor shall be removed in a manner satisfactory to the Contracting Officer.

b. Water for mixing and curing of concrete shall conform to Paragraph 9-07.

SC-11. ELECTRICITY. - All electric current required by the contractor shall be furnished at his own expense. All temporary connections for electricity shall be subject to the approval of the Contracting Officer. All temporary lines will be furnished, installed, connected, and maintained by the contractor in a workmanlike manner satisfactory to the Contracting Officer and shall be removed by the contractor in like manner at his expense prior to final acceptance of the construction.

SC-12. OMITTED.

SC-13. LAYOUT OF WORK AND SURVEYS. - a. Layout of Work. - (1) The Government will establish all base lines, bench marks and horizontal controls at the site of the work.

(2) From the base lines, bench marks and controls established by the Government, the contractor shall complete the layout of the work and shall be responsible for all measurements that may be required for the execution of the work and to the location and limit marks prescribed in the specifications or on the contract drawings, subject to such modifications as the Contracting Officer may require to meet changed conditions or as a result of necessary modifications to the contract work.

(3) The contractor shall furnish, at his own expense, such stakes, templates, platforms, equipment, tools and material, and all labor as may be required in laying out any part of the work from the base lines and bench marks established by the Government. It shall be the responsibility of the contractor to maintain and preserve all stakes and other marks established by the Contracting Officer until authorized to remove them, and if such marks are destroyed, by the contractor or through his negligence prior to their authorized removal they may be replaced by the Contracting Officer, at his discretion, and the expense of replacement will be deducted from any amounts due or to become due the contractor. The Contracting Officer may require that work be suspended at any time when location and limit marks established by the contractor are not reasonably adequate to permit checking of the work.

b. Quantity Surveys. - (1) The contractor shall furnish all personnel, equipment and material required to make all original and final surveys to determine the quantities forming the basis of final payments. Such surveys will be made under the direct supervision of a Government employee who will also record the notes and supervise the computations by contractor personnel. Original copies of survey notes will become the property of the Government.

(2) The contractor shall make such surveys and computations as are necessary to determine the quantities of work performed or placed during each period for which a progress payment is to be made. All original field notes, computations, and other records taken by the contractor for the purpose of progress surveys shall be furnished promptly to the representative of the Contracting Officer and shall be used to the extent necessary in determining the proper amount of progress payments due to the contractor. Unless waived in each specific case, quantity surveys made by the contractor shall be made under the direction of a representative of the Contracting Officer.

c. Verification. - The Government may make checks as the work progresses to verify lines and grades established by the contractor and to determine the conformance of the completed work as it progresses with the requirements of contract specifications and drawings. Such checking by the Contracting Officer or his representative shall not relieve the contractor of his responsibility to perform all work in accordance with the contract drawings and specifications and the lines and grades given therein.

SC-14. PAYMENTS FOR MOBILIZATION AND PREPARATORY WORK. - Payments will not be made under this contract for mobilization and preparatory work.

SC-15. DAMAGE TO WORK. - a. The responsibility for damage to any part of the permanent work shall be as set forth in the article of the contract entitled "Permits and Responsibility for Work". However, if, in the judgment of the Contracting Officer, any part of the permanent work performed by the contractor is damaged by hurricane, tornado, flood or earthquake which damage is not due to the failure of the contractor to take reasonable precautions or to exercise sound engineering and construction practices in the conduct of the work, the contractor will make the repairs as ordered by the Contracting Officer and full compensation for such repairs will be made at the applicable contract unit or lump sum prices as fixed and established in the contract. If, in the opinion of the Contracting Officer, there are no contract unit or lump sum prices applicable to any part of such work equitable adjustment pursuant to Article 3, Changes, of the contract, will be made as full compensation for the repairs of that part of the permanent work for which there are no applicable contract unit or lump sum prices. Except as herein provided, damage to all work (including temporary construction), utilities, materials, equipment and plant shall be repaired to the satisfaction of the Contracting Officer at the contractor's expense, regardless of the cause of such damage.

b. Maintenance of Drainage. - The contractor will be required to maintain adequate drainage through drainage structures and waterways during the life of the contract. When winter weather conditions are such as to cause obstruction of normal drainage ways by accumulations of ice, snow, or a combination of both, suitable measures, such as application of salt, shall be instituted by the contractor and maintained to prevent damage to materials or new or existing work.

SC-16 to SC-23, Inclusive. OMITTED.

SC-24. FUNDS AVAILABLE FOR PAYMENTS. - a. Such work as may be done under this contract in excess of the amount for which funds are available for payment as herein set forth, will be continued with funds hereafter appropriated and alloted for this work.

b. From funds heretofore appropriated by the Public Appropriation Act of 1963, Public Law 87-880, the sum of $50,000 is available for payments to the contractor for work performed under this contract.

c. If at any time it becomes apparent to the Contracting Officer that the balance of this allocation is in excess of the amount required to meet all payments due and to become due the contractor because of work performed and to be performed pursuant to his approved progress schedule, the right is reserved after due notice to the contractor to reduce said allocation by the amount of such excess.

d. If the rate of progress of the work is such that it becomes apparent to the Contracting Officer that the balance of this allocation and any allocation for this and any subsequent fiscal years during the period of this contract is less than that required to meet all payments due and to become due the contractor because of work performed or to be performed under this contract, the Contracting Officer may provide additional funds for such payments if there be funds available for such purpose. The contractor will be notified in writing of any additional funds so made available. However, it is distinctly understood and agreed that the amount of funds stated in b. above is the maximum amount the Government insures will be available during the current fiscal year and the Government is in no case liable for payments to the contractor beyond this amount prior to having notified the contractor in writing of any additional funds that can be made available. Accordingly, no progress schedule will be approved (see Par. GC-5a) which contemplates progress requiring funds in excess of the amount stated to be available in b. above for the current fiscal year and no progress schedule will be approved for any ensuing fiscal year which contemplates progress requiring funds in excess of the amount allocated by the Contracting Officer from funds subsequently made available, except as set forth and subject to the conditions in subparagraph i. below.

e. It is expected that, during subsequent fiscal years over the period of this contract, Congress will made additional appropriations

for expenditure on work under this contract. The Contracting Officer will notify the contractor of any additional allocation of funds to this contract when such funds become available. It is understood and agreed that the Government is in no case liable for damages in connection with this contract on account of delay in payments to the contractor due to lack of available funds. Should it become apparent to the Contracting Officer that the available funds will be exhausted before additional funds can be made available, the Contracting Officer will give at least 30 days written notice to the contractor that the work may be suspended. If the contractor so elects, after receipt of such notice, he may continue work under the conditions and restrictions under the specifications, so long as there are funds for inspection and superintendence, with the understanding, however, that no payment will be made for such work unless additional funds shall become available in sufficient amount. When funds again become available, the contractor will be notified accordingly. Should work be thus suspended, additional time for completion will be allowed equal to the period during which work is necessarily so suspended, as determined by the dates specified in the above-mentioned notices.

f. So long as funds are available, payments will be made monthly in accordance with article of the contract entitled, "Payments to Contractors". The unit prices or lump-sum prices stated in the contract will be used in determining the amount to be paid for work performed by the contractor.

g. The procedure above described will be repeated as often as may be necessary on account of the exhaustion of available funds and the necessity of awaiting the appropriation of additional funds by Congress.

h. Should Congress fail to provide additional funds the contract may be terminated and considered to be completed, at the option of the contractor, without prejudice to him or liability to the Government, at any time subsequent to 30 days after payments are discontinued, or at any time subsequent to 30 days after the passage of the Act which would have but did not carry an appropriation for continuing the work or after the adjournment of the Congress which failed to make the necessary appropriations. However, if the funds cited in the contract are enough to extend the work beyond the end of the fiscal year and no new funds are allocated to the contract for the ensuing fiscal year, the contractor must first exhaust all the cited funds and thereafter he may, at his option, exercise the rights provided in this paragraph any time after payments are discontinued.

i. The progress chart prepared in accordance with GC-5(a) will be consistent with the amount of funds stated in subparagraph b above, as being currently available for the period of time from the date of contract award to the end of the fiscal year in which the contract was awarded, or at the option of the contractor, the chart may be prepared on the basis of accomplishment of work at a greater rate of progress for the period of time applicable to currently available funds. Any chart initially submitted for approval which contemplates progress at a

greater rate than can be paid for with currently available funds will be approved only under the condition that such approval will in no way obligate the Government to make additional funds available for the work. That part of the chart which covers the work for which funds are not currently available will be prepared on the basis of a schedule considered to be practicable by the contractor for accomplishment of the work at such rate of progress as he may desire for completion within the terms of the contract. The progress chart will be revised each time the contractor is notified that additional funds are made available. Each revision will conform with the criteria stated above. With reference to the responsibilities for future funding of the work in accordance with the progress chart, attention is called to the preceding subparagraphs wherein the responsibilities of the Government are set forth for the furnishing of funds for the work. The approval of that part of the schedule covering work for which funds are not currently available will in no way obligate the Government to provide funds to accomplish work at the rate of progress indicated in the schedule.

SC-25 thru SC-27, Inclusive. OMITTED.

SC-28. SCHEDULING AND DETERMINATION OF PROGRESS. - a. Independent of partial payments made pursuant to General Provision 7, Payments, (Standard Form 23A), progress schedules prepared under the requirements of GC-5, Progress Charts and Requirements for Overtime Work, shall provide as scheduled progress for only 25 percent of the estimated invoiced cost of materials or equipment delivered to the site but not incorporated in the work as of the time of the scheduled delivery thereof.

b. In determining progress accomplished the Contracting Officer will allow as an element of work accomplished (progress toward completion) only 25 percent of the invoiced cost of materials or equipment delivered to the site but not incorporated in the construction up to the time the materials or equipment are actually incorporated in the work.

SC-29. TIME EXTENSIONS. - Notwithstanding any other provisions of this contract it is mutually understood that the Government has the right to determine the extent, if any, by which a change in plans or specifications or excusable delays will cause delay in the completion of various elements of construction. The Contracting Officer may unilaterally provide in a change order that a contract completion date will be extended only for those specific elements so delayed and that the remaining contract completion date(s) for all other portions of the work would not be altered and further provide for an equitable readjustment of liquidated damages, if any, pursuant to the new completion schedule.

SC-30. REVERSE SIGNAL ALARMS. - All self-propelled construction equipment, except light service trucks, panels, pickups, station wagons, crawler-type cranes, power shovels and draglines, whether moving alone or in combination shall be equipped with a reverse signal alarm. The alarm shall be mounted on the rear of the equipment and shall be so

protected or constructed as to withstand severe wear and tear, adverse weather and unfavorable environmental working conditions and shall be certified by the manufacturer as fully meeting the following performance standards.

The alarm shall produce a relatively pure tone which shall peak within the American Standards Association standard octave passband of 600 to 2400 cycles per second and shall produce a 0.2 to 0.5 second audible warning within the initial three (3) feet of backward movement of the vehicle on which it is mounted and at regular intervals, not to exceed three (3) seconds throughout the backward movement. The alarm shall automatically cut out when backward movement ceases. The sound intensity of the alarm shall range from and not exceed 90-100 db (decibels) at a horizontal distance of 5 feet from the alarm.

Actuation of the alarm shall be automatic by direct connection to any part of the equipment that moves or acts in a manner distinctive only to the rearward movement of the vehicle with no manual controls of any kind between the source of actuation and the alarm. Where application of this requirement to specific types of equipment has impractical application other means of actuation may be used upon written approval of the Contracting Officer.

The use of the alarm shall be in addition to prescribed requirements for signalmen.

SC-31 and SC-32. OMITTED

SC-33. CERTIFICATES OF COMPLIANCE. - Any certificates required for demonstrating proof of compliance of materials with specification requirements shall be executed in three (3) copies. Each certificate shall be signed by an authorized officer of the manufacturing company and shall contain the name and address of the contractor, the project name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the date or dates of the tests to which the report applies. Certification shall not be construed as relieving the contractor from furnishing satisfactory material, if, after tests are performed on selected samples, the material is found not to meet the specific requirements.

SC-34. PERFORMANCE OF WORK BY CONTRACTOR. - The contractor shall perform on the site and with his own organization, work equivalent to at least twenty percent (20%) of the total amount of the work to be performed under the contract. If during the progress of the work hereunder, the contractor requests a reduction in such percentage, and the Contracting Officer determines that it would be to the Government's advantage, the percentage of the work required to be performed by the contractor may be reduced; provided, written approval of such reduction is obtained by the contractor from the Contracting Officer.

SC-35. CONTRACT BID BREAKDOWN. - The contractor shall furnish within 10 days after date of award of contract a breakdown of each lump sum bid. Partial payments will be based on this breakdown. The contractor's breakdown will be reviewed by the Contracting Officer to insure that costs are proportioned properly between early and late pay items. Any unbalanced items or other discrepancies will be revised by the Contracting Officer and the approved breakdown will be utilized as a basis for progress payments to the contractor.

SC-36. TEMPORARY HEAT. - All temporary heat required by the contractor in connection with his construction operations shall be furnished or provided by or at the expense of the contractor. No source of any Government type of heating system will be available for the use of the contractor. Heaters shall be listed by the Underwriters' Laboratories, Inc., and be installed and maintained in accordance with the manufacturers' instructions. The use of "salamanders" shall not be permitted.

SC-37. OMITTED.

SC-38. SOILS AND MATERIALS CONTROL. - a. The contractor shall furnish two vehicles, preferably pick-up trucks, the maintenance and operation of which will be the contractor's responsibility, and shall provide two employees, approved and qualified as stated below, to aid the Contracting Officer in the sampling and testing of soils, portland cement concrete, bituminous concrete, and similar materials. Employee qualifications shall include a high school education or the equivalent thereof. The work to be done by these employees shall include, but shall not be limited to, assisting in the performance of field and laboratory tests. Each employee shall be adaptable to the anticipated work and his final acceptance by the Contracting Officer will not be made until he has undergone a two-week training period at the New England Division Laboratories in Waltham, Mass. The personnel and equipment shall be made available within 30 days after receipt of notice to proceed and shall be assigned full-time and continuously to the Contracting Officer until no further sampling and testing is required. The personnel and equipment shall be under the direction and supervision of the Contracting Officer and shall be such as to permit sampling and testing to be maintained and concurrent with the progress of construction to insure that sampling and testing will be performed continuously. Sampling and testing will include that necessary to determine that all construction conforms to contract requirements and such other sampling for the project as directed. The Government soils and material control laboratory for work under this contract will be located at Waterbury Road in the town of Plymouth, adjacent to the proposed location of Hancock Brook Dam. In the event the two vehicles assigned are not sufficient to provide transportation of personnel and samples from job site to laboratory for testing, the contractor shall provide such additional vehicles including drivers as may be required. No separate payment will be made for the services of the above equipment and personnel, the costs of which will be considered as a subsidiary obligation of the contractor.

SC-39. CONSTRUCTION SIGN. - The contractor shall furnish and erect a construction sign conforming to the requirements of Drawing No. HC-1-1691, attached hereto. The sign shall be erected at a location selected by the Contracting Officer not later than 30 calendar days after notice to proceed. Upon completion of the work, the sign will remain the property of the contractor. No separate payment will be made for furnishing, erecting and maintaining the sign.

SC-40. SAFETY SIGN. - The contractor shall construct a safety sign at a location directed by the Contracting Officer. The sign shall be 3 feet by 6 feet in size and shall conform to the requirements of Drawing No. 40-05-06, Sheet 1 of 1 attached hereto. The sign shall be erected as soon as possible and within 30 calendar days after date of notice to proceed. The data required by the sign shall be corrected as necessary. No separate payment will be made for erecting and maintaining the safety sign and all costs in connection therewith will be considered a subsidiary obligation of the contractor. The sign will remain the property of the contractor. A previously built sign meeting above requirements may be reused when satisfactorily reconditioned.

SC-41. ACCIDENT PREVENTION. - a. Contractor's Proposals. - The contractor's proposals for effectuating the requirements of Paragraph GC-16, "Accident Prevention" shall be submitted in quintuplicate to the Resident Engineer as the Contracting Officer's representative.

b. Blasting. - (1) All operations involving the transportation, storage and use of explosives shall be conducted in accordance with applicable laws and the Corps of Engineers' "General Safety Requirements Manual" a copy of which is available for inspection in the office of the Division Engineer and the "Manual of Accident Prevention in Construction".

(2) All vehicles assigned to the daily transportation of explosives and other dangerous articles will be inspected not less frequently than once a week. Vehicles which are occasionally used for this purpose shall be inspected within one week prior to such use.

(3) Inspection shall be performed by competent assigned contractor's personnel other than the operator of the vehicle inspected. Inspection forms will be approved by the Contracting Officer and a completed copy of each inspection will be furnished the Contracting Officer.

(4) Blasting will be permitted only when proper precautions are taken for the protection of all persons, work and property. The contractor shall be liable for all injuries or deaths of persons and all property damage caused by blasting or explosives. The contractor shall provide and keep on the project at all times a radio frequency ammeter or in lieu thereof, a pilot lamp which lights up brightly at 0.06 ampere as recommended in the Institute of Makers of Explosives Pamphlet No. 20,

dated 1956, entitled "Radio Frequency Energy a Potential Hazard in the Use and Transportation of Electric Blasting Caps". Tests for radio energy hazards as described in above referenced Pamphlet No. 20 shall be made before loading every round. The contractor or his surety shall, prior to commencement of blasting operations, make all necessary investigations including inspection of structures near the area of blasting and shall provide such vibration monitoring during blasting operations as may be necessary to assure protection of these structures in conformance with regulatory statutes or directives established by State or other authorities to limit the amount of vibration generated by blasting. These investigations shall be conducted by a qualified vibration engineer and copies of the results of such investigations including test data and records shall be furnished to the Contracting Officer.

c. Outlining Loaded Hole Areas. - The contractor shall be required to clearly outline any loaded hole area, or areas. This may be accomplished by roping off the entire loaded hole area, or by markers of sufficient height, color and spaced so that the entire loaded hole area will be clearly and definitely outlined. The exact method of outlining such areas shall have the prior approval of the Contracting Officer.

d. Protective Headgear. - All employees of the contractor and other persons shall wear protective headgear (hard hats) at all times while in the work area(s). These work area(s) shall be all area(s) within the contract work limits.

e. General Requirements. - All applicable requirements of the safe practices on construction work as covered in the "Manual of Accident Prevention in Construction" as published by the Associated General Contractors of America, Inc., shall apply to the work under this contract. The requirements listed in the manual are minimum requirements and do not decrease or elminate any other accident prevention features covered in other parts of these specifications.

SC-42. OMITTED.

SC-43. GUARANTEE. - Where the Technical Provisions require that certain equipment is to be guaranteed, the guarantee shall be for a period of one year from the date of acceptance thereof, either for beneficial use or final acceptance, whichever is earlier, against defective materials, design and workmanship. Upon receipt of notice from the Government of failure of any part of the guaranteed equipment during the guarantee period, new replacement parts shall be furnished and installed promptly by the contractor at no additional cost to the Government.

SC-44. GOVERNMENT FIELD OFFICE. - Contractor shall provide a Field Office for the Government of approximately 200 sq. ft. within fifteen (15)

calendar days after receipt by him of notice to proceed. This space may be a separate building or may be partitioned space within the contractor's construction building. Office or space provided shall be weathertight and free from drafts. Windows shall be furnished as necessary to provide adequate natural light. The office shall be equipped with a cylinder lock on the door, a plywood top table approximately 6' by 4', and adequate sanitary, heating, lighting and ventilating facilities. The contractor shall provide all services and supplies in connection with heating; lighting and maintaining the building. No separate payment will be made for the Government Field Office and all costs shall be included in the various items comprising the detailed bid schedule.

SC-45. IDENTIFICATION OF MECHANIZED EQUIPMENT. - All contractor's machinery, motor vehicles and mechanized equipment as may be required by the Contracting Officer, shall have posted in a conspicuous location on each piece of equipment, acceptable identification showing the owner's name and an identifying number.

SC-46. OMITTED.

SC-47. PROJECT BULLETIN BOARD. - The contractor shall furnish, install and maintain during the life of the project a weathertight bulletin board approximately 3 feet high by 5 feet wide having not less than 2 hinged or sliding glazed doors with provisions for locking. The bulletin board shall be mounted, where and as approved by the Contracting Officer, in a prominent place accessible to all employees. The bulletin board shall remain the property of the contractor and shall be removed by him upon completion of the contract work. The following information, which will be furnished by the Government to the contractor, shall be posted on the bulletin board and shall be maintained by the contractor in easily readable condition at all times for the duration of the contract.

a. The Equal Employment Opportunity poster and Standard Forms 38, "Notice to Labor Unions or Other Organizations of Workers" (when applicable) as required by General Provisions (Standard Form 23A) Clause 21, "Nondiscrimination in Employment".

b. The schedule of minimum wage rates for the contract as required by Labor Standards Provisions (Standard Form 19A) Provision 1, "Davis-Bacon Act", with the minimum wage rate poster (Form SOL-155).

SC-48 and SC-49. OMITTED.

SC-50. DEVIATIONS FROM CONTRACT REQUIREMENTS. - Deviations from contract requirements will not be permitted, except under unusual circumstances. Submissions of shop drawings and materials will be assumed to be in conformance with plans and specifications, unless they contain an expressed declaration of a deviation, the reasons for it, and request for waiver.

SC-51. CONTRACTOR'S OPTIONS. - The Technical Provisions by specific references permit the contractor to select optional materials, items, systems, or equipment. The use of options is subject to the following conditions:

a. Once an option has been selected and approved, it shall be used for the entire contract.

b. The contractor will be required to coordinate his selection with the plans and specification and to make all necessary adjustments without additional cost to the Government.

SC-52. CONCRETE AGGREGATE - APPROVED SOURCES. - Concrete aggregate meeting the quality requirements of these specifications can be produced from the approved sources listed below:

Type	Source
Fine and Coarse	Building Materials, Inc., Torrington, Conn.
Fine	Dunning Sand and Gravel Co., Farmington, Conn.
Coarse (crushed stone)	Arborio and Sons, Inc., Farmington, Conn.
Fine and Coarse	Colonial Sand and Gravel Co., Waterbury, Conn.
Fine and Coarse	A. Calabro and Sons, Inc., Waterbury, Conn.
Coarse (crushed stone)	New Haven Trap Rock Co., Plainville, Conn.
Fine	Sherman-Tomasso, Inc., Southington, Conn.
Coarse (crushed stone)	Sherman-Tomasso, Inc., New Britain, Conn.
Fine and Coarse	Waterbury Sand and Gravel Co, Prospect, Conn.

Concrete aggregates may be furnished from any of the above listed sources, or at the option of the contractor may be furnished from any other source or sources proposed by the contractor and approved by the Contracting Officer. The contractor shall designate in writing the source from which he will furnish the aggregate. If the fine aggregate and coarse aggregate are not to be furnished from the same source, the contractor shall supply coarse aggregate from one source only and fine aggregate from one source only. If the contractor proposed to furnish aggregate from a source or from sources not already approved, he may designate only one source for both coarse and fine aggregate or one source for each. Samples for testing shall be provided as required by Section 9 of the Technical Provisions. If a source proposed by the contractor is not approved for use as determined by the Contracting Officer, the contractor shall furnish aggregate from an approved source listed above at no additional cost to the Government. Approval of a source of concrete aggregate is not to be construed as approval of all material from that source. The right is reserved to reject materials from certain localized areas, zones, strata, or channels

when such materials are unsuitable for concrete aggregate as determined by the Contracting Officer. Materials produced from an approved source shall meet all of the grading, uniformity, and particle shape requirements of Section 9 of the Technical Provisions of these specifications. Approval of any of the above listed sources pertains to the quality of raw materials only and does not constitute or imply approval or warranty of the available processing equipment or methods.

SC-53. FACTORS AFFECTING THE PROSECUTION OF THE WORK. - a. Litchfield Street. - (1) Litchfield Street (State Road 854) crosses the site of the work and is being relocated by others. Therefore, traffic over existing Litchfield Street will have to be maintained and the contractor shall not interfere with traffic until the new road relocation is completed and he has been so notified in writing by the Contracting Officer. The relocation of Litchfield Street is scheduled to be completed on or about 15 June 1964.

(2) The road relocation contractor will set guide railing along the shoulder of the road closing off the proposed parking area to be constructed under this contract. The contractor, at the appropriated time, shall construct the parking area, remove guide railing, and complete the parking area paving to blend with the road pavement. If necessary, the contractor shall coordinate his work with that of the road contractor. Guide railing shall become the property of the Government and stored where directed. All costs in connection with the removal and storing of guide railing shall be included under Item 1, "Preparation of Site".

b. Dam and Appurtenant Works. - (1) In the construction areas for the dam and appurtenant works prior to 1 April 1964, the contractor will be permitted to perform only the following operations:

(a) Clearing and grubbing of the site of the structures and borrow area.

(b) Initiate and complete the outlet works to effect the river diversion in order to place the dam embankment in the dry on or about 15 June 1964, the date on which the relocated road is scheduled to be completed and the existing Litchfield Street closed to traffic.

(c) Initiate and complete the foundation cut-off trench excavation and the grouting except for that portion crossing existing Litchfield Street.

(d) Clear the reservoir area.

(e) Construct the service road; and

(f) Initiate the excavation of the spillway, provided that the rock materials are stockpiled for later use in the permanent structures at no additional cost to the Government.

(2) After 1 April 1964, the contractor shall perform the following operations:

(a) Initiate and complete the stripping of the borrow area and the embankment prior to diversion of the brook through the outlet works.

(b) On or about 15 June 1964 complete the foundation cut-off trench excavation and the grouting.

(c) Construct the required cofferdams.

(d) Initiate the dam embankment on or about 15 June 1964, and complete the dam embankment by 30 November 1964 except for the trench required for the air vent pipe and the Bubble Gage pipe conduit; and

(e) Complete the spillway excavation and structures.

(3) Placing of the air vent pipe and the Bubble Gage pipe conduit and the subsequent filling of the trench will not be permitted prior to 1 April 1965.

c. The contractor shall provide at all times an adequate number of flagmen and traffic policemen to maintain and control traffic on the existing Litchfield Street, until the new road has been constructed and is open to traffic, and traffic over the existing road is discontinued. No separate payment will be made for this work and all costs in connection therewith will be considered a subsidiary obligation of the contractor.

d. The existing electric line and telephone line along Litchfield Street will be removed by others. Therefore, prior to 1 April 1964, the contractor shall contact the Hartford Electric Light Company and The South New England Telephone and Telegraph Co., owners of the respective lines, to remove these lines.

e. The contractor shall maintain and repair at his own expense those portions of existing paved and unpaved roads which he, by necessity, uses as access to the construction area and for handling of materials during construction operations. The contractor shall also provide all necessary traffic control. At the contract completion, these roads shall be repaired and restored to their original condition. The contractor shall make his own arrangements with contractor building the relocated Litchfield Street or with the State of Connecticut if he intends to use any portion of the new road as access to the construction area or for handling materials during the construction operations.

f. Responsibility. - Section 2 covers the construction of auxiliary and temporary cofferdams relative to the construction of certain phases of the work. The contractor's attention is directed to the

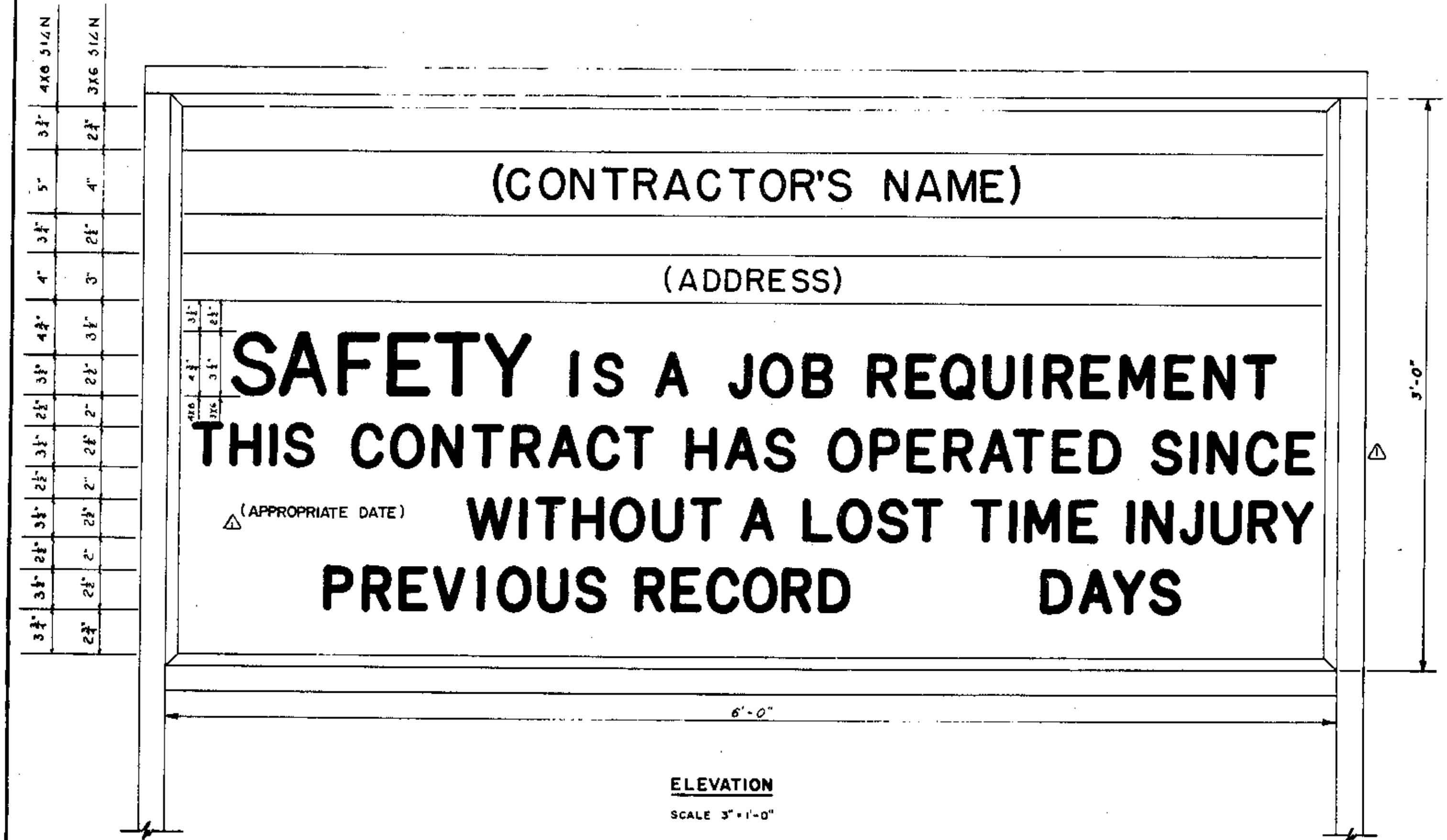
fact that any damage to the new work by flooding due to failure of the contractor to properly construct the temporary and auxiliary cofferdams shall be repaired by and at the expense of the contractor.

SC-54. WARNING SIGNS. - The contractor shall construct, erect, and maintain at least four warning signs at various locations, where directed, along the perimeter of the contractor's work areas. These signs will generally be located where existing roads enter the work areas. The signs shall be 4 feet by 2 feet in size and shall be securely mounted on wood posts provided and installed by the contractor. The signs may be made of 1/2-inch plywood, 3/4-inch dressed stock, not less than 8-inches in width held together with 3/4-inch by 2-inch battens on the rear, or from galvanized sheet metal (16 gage) properly reinforced. After assembly, all surfaces of the sign shall be given not less than two coats of a white exterior type finish paint. If wood is used, the wood shall be primed prior to finish painting. Lettering shall be of proper size for the intended use and shall be done by a sign painter, using quick-drying paint. The following words shall appear on the sign:

DANGER
BLASTING OPERATIONS
TURN OFF ALL 2-WAY RADIOS

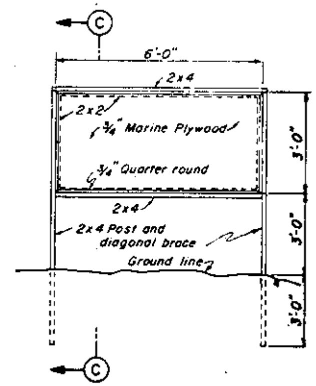
Wood signs shall be fastened to wood posts with not less than three 2-inch galvanized wood screws. Metal signs shall be installed in similar manner. The warning signs shall be erected as soon as possible and within 30 calendar days after date of receipt of notice to proceed. No separate payment will be made for erecting all signs and maintaining and removal of the warning signs when the entire work is completed, and all costs in connection therewith will be considered a subsidiary obgliation of the contractor.

SC-55. PLANT. - The contractor agrees to keep on the job sufficient plant to meet the requirements of the work. The plant shall be in satisfactory operating condition and capable of safely and efficiently performing the work as set forth in the specifications and the plant shall be subject to inspection by the Contracting Officer at all times.

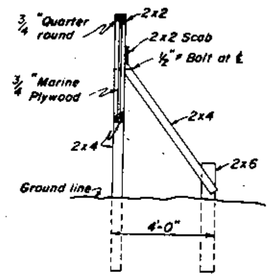


ELEVATION

SCALE 3" = 1'-0"



ELEVATION



SECTION C-C

3' x 6' SIGN

(4' x 8' SIGN SIMILAR)

NOTE:

This elevation is of a 3' x 6' Sign. See specifications for size required under this contract.

⚠ **SPECIFICATIONS**

1. Posts, rails and bracing shall be No.1 yellow pine or approved equal S4S-Fed. Spec. MM-L-751c.
2. All exposed surfaces, including edges, shall be given one coat of linseed oil and wiped prior to primer coat, one coat of exterior lead and oil primer conforming to Fed. Spec. TT-P-25a, and two finish coats of white exterior paint conforming to Fed. Spec. TT-P-104.
3. Black lettering paint shall be Kem Bulletin Color C20 Bl as manufactured by Sherwin-Williams Co., or approved equal.
4. Plywood shall conform to Commercial Standard CS-45, exterior type, Grade A-C.

REVISION	DATE	DESCRIPTION	BY
⚠	4-11-57	Sign information and specifications revised.	

CORPS OF ENGINEERS U. S. ARMY
OFFICE OF THE DIVISION ENGINEER
NEW ENGLAND DIVISION
BOSTON MASS

DES BY	DR BY	CK BY
C.H.P.	W.B.	K.W.W.

CHIEF DESIGN BRANCH

PROJECT ENGINEER

SUBMITTED BY:

CHIEF MILITARY BRANCH

APPROVED:

CHIEF ENGINEERING DIV.

APPROVED:

COL. C.E. FOR THE DIVISION ENGINEER

DATE JULY 1955

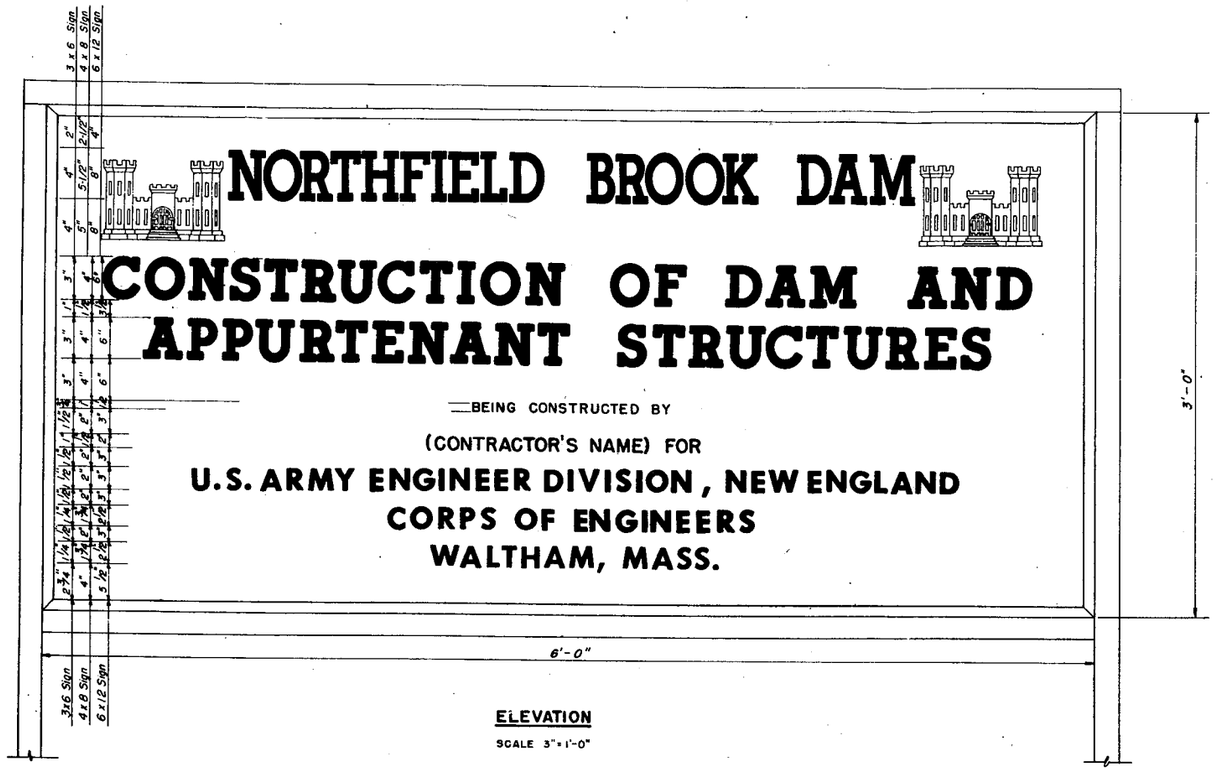
SAFETY SIGN

SCALE AS SHOWN | SPEC NO.

DRAWING NUMBER 40-05-06

SHEET 1 OF 1

⚠

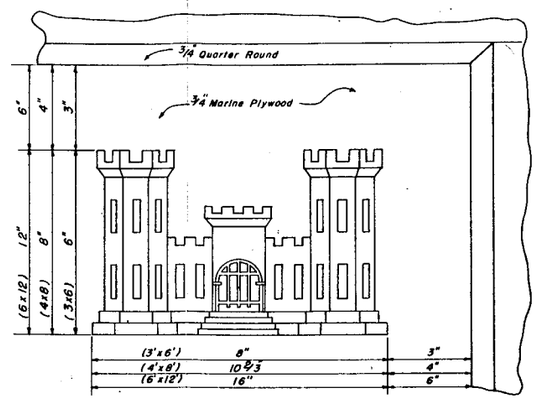


ELEVATION

SCALE 3" = 1'-0"

NOTE:

This elevation is of a 3' x 6' sign. See specifications for size required under this contract.

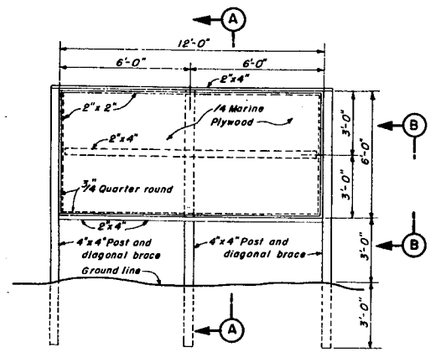


DETAIL OF CASTLE

SCALE 6" = 1'-0"

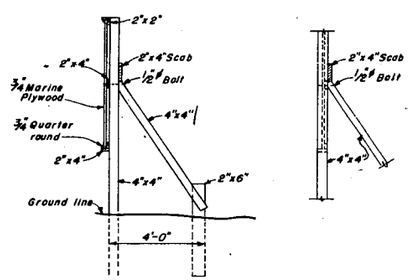
SPECIFICATIONS

1. Posts, rails and bracing shall be No.1 yellow pine or approved equal S4S-Fed. Spec. MM-L-751c.
2. All exposed surfaces shall be given one coat of linseed oil and wiped prior to primer coat.
3. All exposed surfaces shall be given one coat of exterior lead and oil primer-Fed. Spec. TT-P-25a and two finish coats of white exterior oil paint-Fed. Spec. TT-P-104.
4. Black lettering and red Engineer Castles shall be Kem Bulletin Colors C20 B1 and C20 R7 respectively as manufactured by Sherwin-Williams Co.,or approved equal.
5. Marine Plywood shall conform to Commercial Standard CS-45, exterior type, Grade A-C.



ELEVATION

6' x 12' SIGN

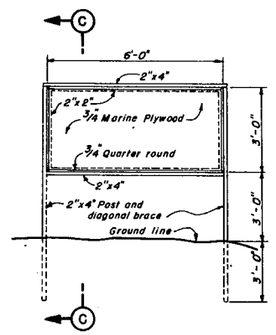


SECTION A-A

SECTION B-B

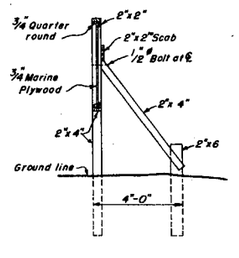
CONSTRUCTION SIGNS

SCALE 3/8" = 1'-0"



ELEVATION

3'x6' SIGN
AND
4' x 8' SIGN



SECTION C-C

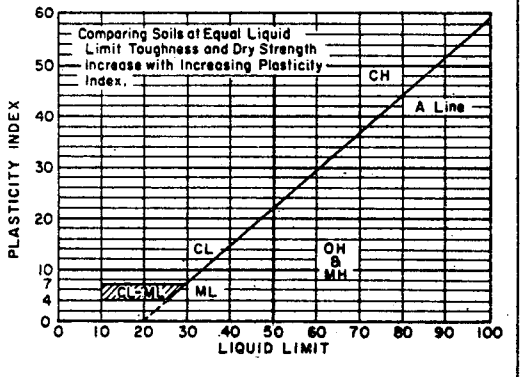
CONSTRUCTION SIGN

DRAWING NUMBER
HC-1-1691

UNIFIED SOIL CLASSIFICATION
(Including Identification and Description)

Major Divisions			Group Symbols	Typical Names	Field Identification Procedures (Excluding particles larger than 3 in. and basing fractions on estimated weight)	Laboratory Classification Criteria
Coarse-grained Soils: More than half of material is larger than No. 200 sieve size.	Gravels: More than half of coarse fraction is larger than No. 4 sieve size. (For visual classification, the 1/4-in. size may be used as equivalent to the No. 4 sieve size)	Clean Gravels (Little or no fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.	Determine percentages of gravel and sand from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse-grained soils are classified as follows: Less than 5% GW, GP, SW, SP. More than 12% GM, GC, SM, SC. 5% to 12% Borderline cases requiring use of dual symbols.
			GP	Poorly graded gravels, or gravel-sand mixtures, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.	
		Gravels with Fines (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixture.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).	
			GC	Clayey gravels, gravel-sand-clay mixture.	Plastic fines (for identification procedures see CL below).	
	Sands: More than half of coarse fraction is smaller than No. 4 sieve size. (For visual classification, the 1/4-in. size may be used as equivalent to the No. 4 sieve size)	Clean Sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines.	Wide range in grain size and substantial amounts of all intermediate particle sizes.	$C_u = \frac{D_{60}}{D_{10}}$ Greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3. Not meeting all gradation requirements for GW. Atterberg limits below "A" line with PI less than 4; Atterberg limits above "A" line with PI greater than 7. Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols.
			SP	Poorly graded sands or gravelly sands, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.	
		Sands with Fines (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).	$C_u = \frac{D_{60}}{D_{10}}$ Greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3. Not meeting all gradation requirements for SW. Atterberg limits above "A" line or PI less than 4; Atterberg limits above "A" line with PI greater than 7. Limits plotting in hatched zone with PI between 4 and 7 are borderline cases requiring use of dual symbols.
			SC	Clayey sands, sand-clay mixtures.	Plastic fines (for identification procedures see CL below).	

Major Divisions		Group Symbols	Typical Names	Identification Procedures on Fraction Smaller than No. 40 Sieve Size: Dry Strength (Crushing characteristics)	Dilatancy (Reaction to shaking)	Toughness (Consistency near PL)
Fine-grained Soils: More than half of material is smaller than No. 200 sieve size. The No. 200 sieve size is about the smallest particle visible to the naked eye.	Silts and Clays: Liquid limit is less than 50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.	None to slight	Quick to slow	None
		CL	Inorganic clays of low to medium plasticity gravelly clays, sandy clays, silty clays, lean clays.	Medium to high	None to very slow	Medium
		OL	Organic silts and organic silty clays of low plasticity.	Slight to medium	Slow	Slight
	Silts and Clays: Liquid limit is greater than 50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	Slight to medium	Slow to none	Slight to medium
		CH	Inorganic clays of high plasticity, fat clays.	High to very high	None	High
		OH	Organic clays of medium to high plasticity, organic silts.	Medium to high	None to very slow	Slight to Medium
Highly Organic Soils		PT	Peat and other highly organic soils.	Readily identified by color, odor, spongy feel and frequently by fibrous texture.		



PLASTICITY CHART
For laboratory classification of fine-grained soils

(1) Boundry classifications: Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well-graded gravel-sand mixture with clay binder.
(2) All sieve sizes on this chart are U. S. standard.

NOTE

For further information on Unified Soil Classification, refer to "The Unified Soil Classification System," Volumes 1 and 2, Technical Memorandum No. 3-357, published by U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. File copies may be examined at Headquarters, U. S. Army Engineer Division, New England, 424 Trapelo Road, Waltham, Massachusetts., Building 141, Foundation and Materials Branch.

Adopted by Corps of Engineers and Bureau of Reclamation, January 1952

NEDGL 61-5C

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL	PERM.	
FD-1	474.2	B-6	5.0-10.0	GP-GM	49	45	6	0.12														
FD-5	476.1	B-7	5.0- 6.1	GP	52	46	2	0.28														
		B-12	10.0-12.7	SP	31	67	2	0.15														
FD-7	475.5	B-2	0.4- 5.0	GP	57	40	3	0.22														
		B-8	8.0-13.0	GP-GM	48	44	8	0.090														
FD-8	478.6	B-5	5.0- 7.2	SP-SM	39	55	6	0.12														
FD-18	507.4	B-5	3.4- 5.0	SM	28	54	18	0.037														
		B-14	14.2-16.2	SM	8	61	31	0.032														
FD-20	566.6	B-4	7.0-12.0	SM	23	43	34	0.016														
FD-21	473.7	B-6	5.0- 8.0	GP-GM	51	42	7	0.18														
		B-9	10.0-11.6	SP-SM	26	68	6	0.16														
FD-22	527.5	B-2	2.0- 5.0	SM	29	48	23	0.025														
FD-23	495.3	B-5	5.0- 8.6	SM	30	57	13	0.060														
FD-26	494.5	B-4	2.3- 5.0	GM	49	38	13	0.060														

* PROVIDENCE VIBRATED DENSITY TEST.

NORTHFIELD BROOK DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	PVD * LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL	PERM.	
FT-1	492.8	B-1	0.8-2.6	SM	27	36	37	0.015	Nonplastic													
FT-2	537.8	B-1	0.7-2.5	SM	14	38	48	0.007	Nonplastic													
FT-3	496.8	B-1	0.8-2.4	SM	4	60	36	0.023														
FT-4	548.4	J-1R	0.6-4.2	SM								18.3	20.3									
		B-2	0.6-4.2	SM	32	43	25	0.020	Nonplastic													
		J-5R	5.4-8.0	SM								15.1	17.5									
		B-6	5.4-8.0	SM	36	45	19	0.030	Nonplastic													
FT-5	537.9	J-3R	1.9-6.7	SM								6.2	8.2									
		B-4	1.9-6.7	SP-SM	43	48	9	0.085														
FT-6	512.0	J-1R	0.9-3.9	SM								17.2	24.1									
		B-2	0.9-3.9	SM	15	49	36	0.012														
		J-3R	3.9-7.5	SP-SM								7.0	9.0									
		B-4	3.9-7.5	SP-SM	24	68	8	0.090														

* PROVIDENCE VIBRATED DENSITY TEST.

NORTHFIELD BROOK DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX DRY DENS. LBS/CU FT	PVD * LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL	PERM.
BD-1	578.4	B-5	5.0- 8.0	SM	22	54	24	0.011													
		J-6R	5.0- 8.0	SM								14.0	14.3								
		B-10	15.0-20.0	SM	12	54	34	0.075	Nonplastic												
		J-11R	15.0-20.0	SM								12.2	13.0								
BD-2	588.5	B-6	6.5-10.0	SC	19	39	42	0.001	32	21											
		J-7R	6.5-10.0	SC								16.7	17.1								
BD-3	644.7	J-5R	5.0-10.0	SC								18.2	18.4								
		B-6	5.0-10.0	SC	25	30	45	0.0018	29	21											
		J-11R	20.0-25.0	CL								13.6	14.3								
		B-12	20.0-25.0	CL	11	31	58		28	20											
		J-13R	25.0-29.6	CL								25.7	25.9								
		B-14	25.0-29.6	CL	8	25	67		39	23											
BD-4	707.4	B-3	1.6- 5.0	SM	20	45	35	0.006													
		J-4R	1.6- 5.0	SM								11.5	12.3								
		B-7	10.0-14.3	SM	11	48	41	0.005	19	16											
		J-8R	10.0-14.3	SM								10.2	10.6								
		B-9	15.0-20.0	SM	19	40	41	0.004	18	16											
		J-10R	15.0-20.0	SM								11.6	11.8								
		B-13	25.0-30.0	SM					17	15											
		B-15	30.0-35.0	ML-CL	7	42	51	0.0014	23	17											
		J-16R	30.0-35.0	ML-CL								10.8	10.8								
		B-19	40.0-45.0	ML-CL	4	43	53	0.002	22	17											
		B-23	50.0-55.0	ML-CL	4	43	53	0.0014	23	17											
		J-24R	50.0-55.0	ML-CL								10.6	11.0								
		B-25	55.0-60.0	ML-CL	3	41	56	0.001	24	18											
		J-26R	55.0-60.0	ML-CL								14.6	14.8								
		B-29	65.0-70.0	ML-CL					26	18											
		J-30R	65.0-70.0	ML-CL								11.0	11.3								

* PROVIDENCE VIBRATED DENSITY TEST.

NORTHFIELD BROOK DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA				NAT. DRY DENSITY LBS/CUFT		OTHER TESTS			pH
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	- NO4	STND AASHO OPT. WATER % DRY WT	STND AASHO MAX DRY DENS. LBS/CU FT	* PVD LBS/CU FT		TOTAL	- NO4	SHEAR	CONSOL	PERM.	
BD-5	717.0	J-1R	0.0- 0.9	Topsoil																			4.48
		J-2R	0.9- 2.4	SM																			4.70
		J-3R	2.4- 4.9	SM								10.8	11.3										5.65
		B-4	2.4- 4.9	SM	11	45	44	0.0047	23	20													
		J-6R	6.0-10.0	SM																			6.23
		J-8R	10.0-15.0	SM								8.1	8.9										8.40
		J-10R	15.0-20.0	ML-CL								14.2	14.2										8.21
		B-11	15.0-20.0	ML-CL	5	40	55	0.0013	22	16													
		J-12R	20.0-25.0	ML-CL								13.4	13.4										8.18
		J-14R	25.0-27.7	SM-SC																			7.87
BD-6	657.2	B-5	5.0-10.0	ML-CL	6	39	55	0.001	27	20													
		J-6R	5.0-10.0	ML-CL								14.9	15.4										
		B-11	20.0-25.0	CL	10	34	56		28	19													
		J-12R	20.0-25.0	CL								12.7	15.1										
		B-15	30.0-35.0	CL	10	31	59		28	20													
		J-16R	30.0-35.0	CL								13.2	13.9										
BD-9	604.5	B-2	0.5- 5.0	SM	8	43	49	0.0030	25	21													
		B-8	10.0-15.0	SM	20	51	29	0.0095	Nonplastic														
		B-16	27.0-29.0	SM	15	42	43	0.0036	23	20													
		J-17R	29.0-30.1	SM-SC	12	40	48	0.0014	26	19													
BD-12	737.2	B-4	5.0-10.0	SM	22	50	28	0.018	Nonplastic														
		J-5R	5.0-10.0	SM								9.6	12.2										
		B-10	15.0-20.0	SM-SC	12	46	42	0.0026	18	14		11.4	11.6										
BD-13	711.2	J-4R	5.0-10.0	SM								10.7	11.2										
		B-5	5.0-10.0	SM	19	53	28	0.014	Nonplastic														
		J-8R	15.0-19.0	SM								10.1	10.5										
		B-9	15.0-19.0	SM	12	56	42	0.0042	17	15													
		J-13R	25.0-27.1	SM								11.4	11.6										
		B-14	25.0-27.1	SM	8	25	34	0.012	Nonplastic														

* PROVIDENCE VIBRATED DENSITY TEST.

NORTHFIELD BROOK DAM

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.	
BD-14	692.0	B-3	2.1- 5.0	SM	5	49	46	0.003	19	16												
		J-4R	2.1- 5.0	SM								13.0	13.2									
		B-10	10.0-15.0	SM	22	45	33	0.006	18	16												
		J-11R	10.0-15.0	SM								9.4	10.0									
		B-12	15.0-20.0	SM-SC	10	46	44	0.003	21	17												
		J-13R	15.0-20.0	SM-SC								10.0	10.7									
		B-16	25.0-29.9	SM	10	49	41	0.0039	17	15												
		J-17R	25.0-29.9	SM								10.3	11.4									
BD-15	660.7	B-5	5.0-10.0	SM	21	46	33	0.018	Nonplastic													
		J-6R	5.0-10.0	SM								12.8	13.2									
		B-11	20.0-25.0	ML-CL	8	39	53	0.002	23	19												
		J-12R	20.0-25.0	ML-CL								9.6	10.3									
		B-16	28.3-30.6	SM	14	52	34	0.0034	23	19												
		J-17R	28.3-30.6	SM								11.7	12.5									
BD-16	581.3	B-5	5.0-10.0	GM	49	34	17	0.045														
BD-17	648.8	B-6	10.0-15.0	ML-CL	4	39	57	0.0014	24	19												
		J-7	10.0-15.0	ML-CL								14.5	14.8									
		B-12	20.0-21.9	SM	24	46	30	0.019														
		J-13	20.0-21.9	SM								15.1	16.2									
BD-20	802.7	J-6R	5.0- 9.0	SM								12.1	13.1									
		B-7	5.0- 9.0	SM	20	57	23	0.024	Nonplastic													
		J-11R	15.0-18.4	ML								12.9	14.2									
		B-12	15.0-18.4	ML	3	31	66	0.0059	Nonplastic													
		J-15R	20.0-22.5	ML								8.8	9.5									
		B-16	20.0-22.5	ML	3	41	56	0.0026	20	16												
		J-19R	25.0-27.7	SM-SC								8.1	8.4									
		B-20	25.0-27.7	SM-SC	10	47	43	0.0015	21	15												

* PROVIDENCE VIBRATED DENSITY TEST.

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL	PERM.
BD-21	769.9	J-3R	5.0- 9.2	SM	7	59	34	0.011				11.1	12.0								
		J-5R	10.0-14.6	SM	1	51	48	0.0057				12.5	12.5								
		J-8R	15.9-18.8	SM	6	59	35	0.0078				7.6	8.3								

* PROVIDENCE VIBRATED DENSITY TEST.

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA SYND. AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			SWELL TEST
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	# PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL	PERM.	
BT-1	589±	B-2	2.6-6.4	ML-CL	7	41	52	0.001	27	20	2.71			12.9	120.8							
		J-3R	4.0-4.5	ML-CL								14.1	15.2									
		US-4	4.5-5.5	ML-CL								15.0	15.1				117.2	116.8				
		J-6R	6.0-6.4	ML-CL								16.2	16.7									
		B-7	6.4-9.8	SM	30	47	23	0.022			2.73										X	
		J-8R	7.0-7.5	SM								11.0	12.8									
		J-10R	9.0-9.5	SM								13.9	16.1									
		B-11	9.8-11.5	SM-SC	14	41	45	0.002	25	21	2.73										X	
		US-13	10.0-10.5									14.0	16.0				116.4	110.0				
BT-2	707±	B-2	2.2-5.5	SM	12	53	35	0.005	19	17	2.71			10.2	127.9							
		US-4	4.0-5.0	SM								9.5	10.7				125.8	122.0				
		US-5	4.0-5.0	SM								9.9	11.2				127.4	123.2				
BT-3	717±	B-2	2.9-7.4	SM	16	55	29	0.009	Nonplastic		2.70											
		US-4	5.0-6.0	SM								10.9	12.6				127.8	123.4				
		US-5	5.0-6.0	SM								11.0	11.8				127.6	125.3				
		B-8	7.4-11.6	SM	15	51	34	0.010	Nonplastic		2.73			9.2	128.6				X		X	
		US-9	10.5-11.5									7.2	7.3				130.8	127.0				
		J-10R	12.5-13.0									9.7	10.3									
BT-4	657±	B-3	3.9- 6.2	ML-CL	8	41	51	0.001	24	20	2.73											
		US-5	8.0- 9.0	ML-CL								15.8	16.6				116.6	114.8				
		US-6	8.0- 9.0	ML-CL								11.8	13.0				123.5	120.3				
		B-7	6.2-11.0	ML-CL	7	36	57	0.001	27	20	2.75										X	
		B-10	11.0-16.0	CL	12	35	53	0.001	27	19	2.76			12.0	121.9				X			X
		US-11	13.5-14.5	CL								14.2	16.7				122.9	118.6				

PROVIDENCE VIBRATED DENSITY TEST.

NORTHFIELD BROOK DAM

SECTION 1

PREPARATION OF SITE
(Item 1)
(Index)

SECTION 1

PREPARATION OF SITE
(Item 1)

1-01. SCOPE. - Work covered by this section of the specifications consists in furnishing all plant, labor, equipment and appliances and in performing all operations in connection with the preparation of the site of the work, except the borrow area, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

1-02. CLEARING AND GRUBBING. - a. General. - Clearing shall consist of the satisfactory felling and removal of all trees and vegetation (except grass) together with down timber, snags, brush and rubbish and other objectionable material and vegetation other than grass and leaves from the areas specified, all fences and stone walls occurring within the limits of the areas to be cleared, the removal of existing shed, and the removal of the existing broken dam downstream of the dam embankment. Grubbing shall consist of the below ground removal and disposal of all stumps, natural growth, and buried logs, from areas specified.

b. Clearing. - The areas to be cleared shall include all existing uncleared areas at the site of all new permanent works and spoil areas, together with a 10-foot strip measured horizontally beyond and contiguous thereto for the foundation areas for dam and all other fill areas, a 10-foot strip measured horizontally beyond and contiguous thereto for all cut sections, and as required for the log boom, and to the limits as shown on the drawings. Where grubbing is not specified stumps shall be left not more than 6 inches higher than the existing ground, except as specified in Section 3 relative to clearing in spoil areas. The contractor shall clear 5 feet each side of the fence lines.

c. Grubbing. - The areas to be grubbed include the foundation areas for the dam embankments and the areas for all cuts. Also included in areas to be grubbed are the areas of a strip 10 feet wide to be measured horizontally and contiguous to the foundation areas of dam, and areas of a strip 10 feet wide to be measured horizontally and contiguous to the limits of all cut sections. In grubbing out stumps, all tap and lateral roots or other growth over 1-1/2 inches in diameter shall be removed to a depth of 1-1/2 feet below the stripping line in areas to be stripped and to a depth of 1 foot below the ground surface in grubbing areas not to be stripped. In stripping areas within previously wooded areas, as determined by the Contracting Officer, roots with a diameter greater than 1/2 inch shall be removed for a depth of 8 inches by the

use of an approved root raker or scarifier after the stripping operations are completed. The rooting or scarifying operation shall be repeated as often as considered necessary by the Contracting Officer to insure satisfactory removal of roots. After each operation, exposed roots on the surface shall be removed prior to the succeeding operation.

d. Disposal. - All materials removed during the clearing and grubbing operations shall be disposed of by burning or removal to approved disposal areas outside of the reservoir area, unless otherwise authorized, except that merchantable timber shall become the property of the contractor and shall be removed from the site of the work. No material shall be thrown into or left along the banks of the river. The disposal of material shall closely follow the removal thereof so that in case of high water a minimum of debris and brush will be washed downstream. At no time shall such material be placed on land outside the work areas. The contractor shall be responsible for compliance with all Federal and State laws and regulations relative to the building of fires. Disposal by burning shall be under constant attendance until fires have burned out or have been extinguished. Whenever Elm trees are cut, all portions of the trees which are neither buried as directed or burned shall be thoroughly sprayed with a two percent emulsion of DDT.

1-03. REMOVAL OF GUIDE RAILING. - The road relocation contractor will set guide railing along the shoulder of the road closing off the proposed parking area under this contract. The contractor at the appropriate time, shall remove the railing. The contractor shall, if necessary, coordinate his work with that of the road contractor. Removed posts and railing shall become property of Government and stored where directed.

1-04. PAYMENT. - a. Except as noted below, payment for all work in connection with the preparation of site as specified above will be made at the contract lump sum price for Item No. 1, "Preparation of Site". The lump sum price for this item shall reflect the salvage value of the merchantable timber to be removed.

b. Payment for any required filling of holes due to removal of stumps within the limits of the areas to be grubbed will be paid for at the applicable contract unit price for the type of material used.

c. Clearing and grubbing for service road is included under Item 44 (See Section 1B).

d. The lump sum price for Item No. 1 shall include all costs in connection with topsoiling, seeding and mulching not included under other payment items.

SECTION 1A

RESERVOIR CLEARING
(Item 2)
(Index)

SECTION 1A

RESERVOIR CLEARING
(Item 2)

1A-01. SCOPE. - The work covered by this section consists of furnishing all labor and equipment and performing all work required for clearing and disposal of trees, stumps, and other growth in the manner described in subsequent paragraphs and to the limits prescribed under Paragraph 1A-02, "BOUNDARIES", and the removal of the existing highway bridge.

1A-02. BOUNDARIES. - The area to be cleared under this section shall be that portion of the reservoir area at a lower elevation than the 500 foot m.s.l. contour line.

1A-03. MARKING OF UPPER CLEARING LIMIT. - The upper limit of clearing shall be determined by surveys made by the contractor. The contour line shall be identified by stakes or by painted bands on trees near the lines.

1A-04. DEFINITIONS. - a. Trees. - The line of demarcation between brush and trees, for the purpose of distinguishing clearing requirements, is that trees as used herein will be considered as that woody growth not falling within the limits of brush or other growth as defined below.

b. Brush. - That growth which is less than two (2) inches in diameter measured six (6) inches from the ground on the uphill side and is less than six (6) feet in height measured from the ground on the uphill side.

c. Other Growth. - For the purposes of this specification, other growth shall be considered to be woody vines the main trunk of which exceeds two (2) inches in diameter, or for which the length exceeds six (6) feet, measured in the same manner as described for brush in Paragraph 1A-05b.

1A-05. CLEARING REQUIREMENTS. - a. General. - The cutting of brush is not required.

b. All trees, stumps and other growth, not falling within the classification of brush, shall be removed to a height not exceeding six (6) inches above the ground surface measured on the uphill side.

1A-06. DISPOSAL OF MATERIAL. - a. General. - The material cleared from the areas shall be completely removed by transporting from the Government property or burned within the cleared areas unless otherwise approved by the Contracting Officer. All timber from which saw logs, posts, ties or cordwood can be produced will become the property of the contractor and in the interest of conservation it is required that the

contractor make a reasonable effort to dispose of material for these purposes. The contractor may cut timber into convenient lengths at the site but approval of the Contracting Officer must be secured prior to the operation of saw mills within the Government lands. In no case shall cleared material be thrown into or left in the creeks or river. The disposal of material shall closely follow the clearing process so that in case of high water, the cleared materials will not be washed into the river channel. It is intended that existing down timber will remain in place, except that solid, floatable material larger than four (4) inches in diameter at the butt end and longer than eight (8) feet in length, shall be disposed of in the manner prescribed for cleared material. Clean-up of floatable debris shall be accomplished by any practicable means. Scattered pieces may be left in order to avoid hand clean-up provided they are less than 4 inches in diameter at the butt and less than 8 feet in length. The cutting of branches and debris remaining after clean-up, to reduce their length in order to avoid removal, will not be permitted.

b. Burning. - The material cleared may, in general, be burned in any location within the contract area, but the time, location and manner of burning shall be subject to the approval of the Contracting Officer. In the interest of conservation, the contractor may, should he desire to do so, make available to the general public without charge, the material scheduled for burning. No burning operations shall be conducted within 100 feet of any standing timber or inflammable growth. The burning operations shall be subject to all public laws governing such operations and the contractor will be responsible for any damage to life and/or property resulting from fires that are started by his employees or as a result of his operations. The contractor shall furnish at the site adequate fire fighting equipment, such as back tanks, flaps, shovels, rakes, etc., to properly equip his personnel for fighting fires. Fires shall be guarded at all times and shall be under constant attendance until they have burned out or have been extinguished. All burning shall be so thorough that the materials will be reduced to ashes, except that occasional charred pieces of logs or branches not exceeding 4 inches in diameter and 8 feet in length will be permitted to remain. Upon approval by the Contracting Officer, material may be buried after it is determined that it could not be disposed of by methods used in the normal burning operation. All material disposed of in such manner shall be at locations approved by the Contracting Officer and shall be covered with a minimum of 18 inches of earth. Whenever elm trees are cut, all portions of the trees which are neither buried as directed or burned shall be thoroughly sprayed with a two-percent emulsion of DDT.

c. Removal from Site. - Except as otherwise provided, the contractor will be permitted to remove felled and trimmed timber from the site of the work. The contractor will be allowed to stockpile salvaged timber near contour line 500 at approved locations. The Government will assume no responsibility for the protection and safe-keeping of such material. All stockpiled timber must be removed from Government lands before final acceptance of the work will be made.

1A-07. REMOVAL OF EXISTING BRIDGE. - a. General. - The contractor shall remove the existing highway bridge on Litchfield Street over Northfield Brook. The bridge shall be completely removed including abutments, decking and superstructure. After the bridge has been removed, the contractor shall excavate ramps from the street to the brook; the ramps shall have a slope of 1 vertical on 2 horizontal.

b. Debris. - Combustible debris shall be burned in accordance with Paragraph 1A-06. Noncombustible debris from abutments shall be disposed of at such locations below elevation 500 as may be designated by the Contracting Officer. Metallic items and any of the removed materials which the contractor considers marketable shall become his property and shall be removed from the reservoir area.

1A-08. PAYMENT. - a. Payment for all costs in connection with furnishing all labor and equipment and performing all work required for timber and structure clearing in reservoir area as specified herein will be made at the contract lump sum price for Item No. 2, "Reservoir Clearing". No gains or losses due to sales of marketable materials will be deducted from or added to the contract price.

b. Estimates for payment for this work will be as follows:

(1) 60% of the contract price when all timber clearing in reservoir area has been accomplished as specified, and

(2) 40% of the contract price when the existing bridge has been removed and the ramps constructed.

SECTION 1B

SERVICE ROAD
(Item 44)
(Index)

SECTION 1B

SERVICE ROAD
(Item 44)

1B-01. SCOPE. - This section covers the construction of the Service Road, complete.

1B-02. GENERAL. - The contractor shall construct a service road, beginning approximately where shown on the drawings at existing Litchfield Street and ending near the intake structure of the outlet works. The road shall be constructed to maintain automobile and light truck traffic, shall have a minimum width of 12 feet, and shall be free draining. The general alignment of the road shall be as shown; final alignment and grade shall be as required in the field. The elevation of the roadway surface at any location shall be El. 505 or higher. Culverts of adequate size and type shall be provided as indicated and elsewhere where required. All surveys required to layout and construct the service road shall be performed by and at the expense of the contractor.

1B-03. EXCAVATION AND FILL. - The contractor shall perform all required clearing and grubbing excavation, including rock and boulder removal. Where fill to underside of road gravel is less than 3-feet, stripping of topsoil shall be required. Earth or rock materials from required excavations for the service road and/or from contractor-furnished sources shall be provided for earth and rock fills. Rock excavation, gravel bedding and rock fill shall conform to the requirements of Sections 3 and 6. Unclassified excavation and embankment fill shall conform to the applicable requirements of Sections 3 and 5, except as otherwise specified in this section. Compaction of embankment fill shall be to a degree satisfactory to the Contracting Officer to provide satisfactory support and subgrade for the proposed traffic. Topsoiling and seeding shall conform to the requirements of Section 17.

1B-04. ROAD GRAVEL. - The surface of the service road shall consist of 9-inches of road gravel furnished and placed in accordance with the requirements of Section 6.

1B-05. CULVERTS. - Culverts shall be of bituminous-coated, corrugated metal and shall be installed where indicated and elsewhere as required. Minimum diameter of culverts shall be 12-inches, except as otherwise shown or specified. All culverts shall have at least 12-inches minimum earth cover and shall be adequately bedded.

a. The 48" culvert shall be bituminous-coated, corrugated metal pipe of 10-gage. All culverts shall be installed in accordance with the manufacturer's recommendations. All culverts shall be bituminous coated and shall conform to applicable AASHO requirements for corrugated metal pipe culverts.

1B-06. GUARD POSTS. - Guard posts shall conform to the requirements of wood posts as specified in Article 9.01 of the Standard Specifications for Roads, Bridges and Incidental Construction of the State of Connecticut, State Highway Department (Form 808). Posts shall be at least 6'-6" long, shall be standard type, and shall be set 3'-6" into the ground at the locations and spacing indicated.

1B-07. PAYMENT. - a. Payment for all work specified in this section, except as specified in Subparagraphs b and c below, including clearing and grubbing, unclassified excavation, fills, gravel bedding, road gravel, topsoiling and seeding, guard posts, and culverts will be made at the lump sum price for Item No. 44, "Service Road".

b. The removal of all material classified as rock excavation in Section 3 will be measured and paid for as specified for Item No. 6, "Rock Excavation - General".

c. Fencing and gates will be measured and paid for under Items 37 and 38, as specified in Paragraph 14-02.

SECTION 2

CONTROL AND DIVERSION OF WATER
(Item 3)
(Index)

SECTION 2

CONTROL AND DIVERSION OF WATER
(Item 3)

2-01. SCOPE. - The work covered by this section of the specifications consists in furnishing all plant, labor and appliances, and in performing all operations in connection with diverting and controlling the Northfield Brook, dewatering the construction areas within the limits of permanent works and structures, so that these structures may be constructed in the dry, all in accordance with this section of the specifications. This section shall also include all pumping, dewatering, and drainage for lowering of ground water table, so that the work as specified above and in other sections can be constructed in the dry.

2-02. DIVERSION. - The contractor shall initiate and complete the outlet works prior to any diversion; and when the relocation of Litchfield Street now under construction is substantially completed and when the traffic over existing Litchfield Street has been discontinued and when so directed and approved by the Contracting Officer, the contractor shall divert the river through the outlet work. Completion of the relocated Litchfield Street is scheduled for on or about 15 June 1964. (See SPECIAL CONDITIONS).

2-03. COFFERDAMS. - The contractor may select any plan for diversion which will permit placement of the permanent structure fills and rock slope protection in the dry. In order to place the fills in the dry, upstream and downstream cofferdams shall be required. These cofferdams shall be located outside the limits of the permanent structure. The contractor shall select the location, type of construction and height of these cofferdams. Any damage to permanent work resulting from overtopping or other failure of such structures shall be repaired by the contractor and at no additional cost to the Government. Spoil materials shall be used for the construction of these cofferdams. Cofferdams shall be removed when no longer required. All materials placed in the cofferdams shall be graded within the spoil fill area to the elevation indicated and all excess materials shall be removed and placed in other spoil areas.

2-04. CONSTRUCTION SCHEDULE. - The contractor shall complete the dam embankment by 30 November 1964. (See SPECIAL CONDITIONS).

2-05. PAYMENT. - a. The contract lump sum price for Item No. 3, "Control and Diversion of Water", shall include payment for control, diversion and care of the river during construction; the construction, maintenance and removal of cofferdams, including the rebuilding of cofferdams in case of destruction by flood.

b. The contract price under subparagraph 2-05a above shall also include the costs for all pumping, drainage and dewatering,

necessary to obtain and maintain in a dry condition all excavation and work areas, and maintenance of unobstructed flow prior to diversion, and through diversion channels during the remaining period of the contract.

c. Estimates for partial payments for this work will be as follows: Fifty percent of the contract price when the river has been diverted and all cofferdams have been constructed as specified; and fifty percent of the contract price when the entire working area for the dam has been unwatered and the embankment completed and all cofferdams have been disposed of as specified.

SECTION 3

EXCAVATION
(Items 4 thru 8, and 10 and 11)
(Index)

SECTION 3

EXCAVATION
(Items 4 thru 8, and 10 and 11)

3-01. SCOPE. - a. The work covered by this section of the specifications consists of furnishing all plant, labor, equipment, and appliances, and of performing all operations in connection with all excavations, except as noted below, in strict accordance with this section of the specifications and the applicable drawings; and subject to the terms and conditions of the contract. This section of the specifications does not cover excavations for the service road (except as otherwise indicated or specified), bubble gage shelter, drains and culverts and the removal of cofferdams. The requirements for these excepted excavations are covered in other sections of these specifications.

b. The term "required excavation" as used in this section is defined as any or all excavations covered in this section other than those in the borrow area.

3-02. GENERAL PROVISIONS. - a. Utilization of Materials. - The disposition of all excavated materials shall be as directed. With the exception of unsuitable materials, stripping material not required for the production of topsoil, and materials from certain excavations as described below, all excavated materials shall be utilized in the permanent work. Earth material from the required excavations for the construction of the inlet and outlet channels, the outlet works and the foundation cut-off in the dam embankment foundation area and the approach and discharge channels and weir in the spillway area shall be placed in the spoil areas, except that suitable material from the spillway area may be utilized in the embankment if the contractor so elects. Only materials unsuitable for use in the construction of embankments, materials unsuitable for the production of topsoil, and materials designated to be placed in spoil areas may be used in the construction of auxiliary and temporary cofferdams. The Contracting Officer shall be the sole judge as to the suitability of all materials. Materials shall not be spoiled unless specifically authorized or stated herein. Materials from required excavations and the borrow area shall be utilized in the permanent work as specified in other sections of these specifications. The contractor shall conduct the work in a manner to utilize all suitable materials from the required excavations in the permanent work with the exceptions described above. To insure the greatest possible use of materials from required excavations without stockpiling, all required excavations for the project (except for those for the inlet and outlet channels, the outlet works, the foundation cut-off, and the approach and discharge channels and weir in the spillway area) shall be deferred until such time that the suitable materials from these excavations can be used for the construction of embankments and other

fills unless the contractor elects to stockpile these materials at his own expense. Required excavations in the spillway area shall also be deferred if the contractor elects to place suitable materials from these excavations in the embankment.

b. Disposal of Excess and Unsuitable Materials. - Excess and unsuitable material from required and borrow excavations shall be spoiled only when specifically authorized. All materials which are authorized to be spoiled shall be disposed of in the spoil areas shown on the drawings and in excavated portions of the borrow area designated herein as a spoil area. Prior to placement of materials, the foundation areas of all spoil areas shall be cleared of all standing timber leaving no stumps higher than 3 feet above the adjacent ground surface and the material thus obtained shall be disposed of as specified in Section 1, "PREPARATION OF SITE" for materials obtained from other clearing operations. No separate payment will be made for clearing spoil areas, payment for which will be included under Item No. 1 "Preparation of Site". Spoil materials shall be placed to the lines and grades shown on the drawings or as directed. All spoil areas shall be graded to the final limits shown on the drawings or as directed so as to provide sightly and smooth surfaces sloped for suitable drainage. All spoil areas, except as noted on the drawings, shall be topsoiled, seeded and mulched in accordance with Section 17, TOPSOILING, SEEDING AND MULCHING.

(1) When directed by the Contracting Officer, the spoil areas shall be stripped to obtain the required topsoil to be used for topsoiling in accordance with Section 17, TOPSOILING, SEEDING AND MULCHING. No separate payment will be made for stripping the spoil areas, payment for which will be considered a subsidiary obligation included under Item 4 "Unclassified Excavation - General".

c. Stockpiling. - The contractor shall stockpile stripping materials required for the production of topsoil and materials from required rock excavations for rock fill and rock slope protection materials as required for the execution of the work. In addition, the contractor may stockpile other materials for his own convenience subject to prior approval. All materials to be stockpiled shall be placed in approved stockpile areas which have been cleared, grubbed and graded. Stockpiles of impervious and random fill materials shall be located in approved well drained areas and the surfaces of the stockpiles at all times shall be graded for drainage and rolled so as to be smooth and relatively water-tight. Stockpiles of rock fill and rock slope protection materials shall be maintained free of earth and shall be constructed in layers in such a manner as to prevent segregation. Each layer shall be formed by dumping loads of the materials directly upon the surface of the previous layer. The dumped loads shall be leveled only to the extent necessary to form a base for the next layer. No separate payment will be made for the placement of materials in stockpiles or their excavation therefrom, for the

grading of stockpile areas before placement and after removal of the materials. Payment for all work in connection with stockpiling materials under this contract shall be included in the contract unit price per cubic yard for the excavation of the materials from their original sources. Stockpiled materials in excess of the quantity used in the permanent work shall be removed and placed in designated spoil areas unless the stockpile area is approved as a spoil area.

d. Shoring and Sheeting, Safety Mesh and Rock Bolting. - The contractor shall be responsible for the unfinished work, and for the safety of workmen from danger of caving, slides and rockfalls unless otherwise specified. Shoring and sheeting may be used at the option of the contractor, except that if considered necessary and the contractor does not use them, their use will be ordered at no additional cost to the Government. Shoring and sheeting shall not be used for excavations which are to be filled or backfilled with compacted materials unless specifically authorized. Shoring and sheeting shall be erected in a safe and workmanlike manner, in accordance with the requirements of the Corps of Engineers Manual, "General Safety Requirements," and shall be placed in such a way as to afford an ample clearance for ready inspection of permanent work. Shoring and sheeting shall be moved upon completion of the permanent work as soon as the construction does not require its use. Where shoring and sheeting are used in lieu of excavations to full dimensions of the pay lines, measurement will be taken to the payment lines as shown on the drawings. Safety mesh shall be installed as specified in Paragraph 3-08. Rock bolts shall be installed in the scaled rock faces as specified in Section 4, "ROCK BOLTING". Precautions shall be taken to insure the safety of personnel from hazards of rock falls or rock slides.

e. Temporary Drains, Pumping and Unwatering. - The contractor shall maintain the sites of work and adjacent grounds in a well-drained condition. Temporary drains, cofferdams, and ditches required shall be constructed by the contractor at no additional expense to the Government. The contractor shall provide all necessary equipment and materials, and shall unwater and maintain in a dry condition the foundation areas for the various features of work to the extent required by the provisions in this and other sections of the specifications for excavation, preparation of foundation for the dam, grouting, placement of fill, backfill, and all materials in the dam and for the construction of concrete structures. All auxiliary and temporary cofferdams shall be removed to the satisfaction of the Contracting Officer. Payment for pumping, unwatering, and lowering the ground water table for various features shall be included in applicable payments for excavations of materials, except as provided in Section 2, "CONTROL AND DIVERSION OF WATER" of these specifications.

f. Stones in Excavations. - Boulders and stones will be encountered during unclassified excavation. Boulders and stone encountered in required excavations shall be disposed of as directed. Stones and boulders shall be removed from random and impervious fill materials prior to compaction and shall be utilized in rockfills as specified in Section 5, "EMBANKMENT" of these specifications. Stones and boulders removed from material during borrow excavation shall be disposed of within the excavated portions of the borrow area in an approved manner to form sightly piles.

g. Salvage of Stripping Material for Topsoil. - To the extent required, portions of stripping material shall be processed for topsoil in accordance with Section 17, "TOPSOILING, SEEDING, AND MULCHING", of these specifications.

3-03. CLASSIFICATION. - Except as otherwise prescribed, excavations will be classified as follows:

a. Unclassified Excavation. - Unclassified excavation shall comprise the satisfactory removal of all materials including those removed with the aid of drilling and blasting, except the materials removed as rock excavation as defined in subparagraph b. below.

b. Rock Excavation. - Rock excavation shall consist of the satisfactory removal of the following:

(1) Boulders of rock blocks detached from bedrock measuring 2 cubic yards or more in volume.

(2) Bedrock which, as determined by the Contracting Officer, can be removed only by systematic and continuous drilling and blasting. Where material is encountered for which the contractor claims classification as rock excavation for its removal, such material shall be uncovered and exposed and the Contracting Officer notified before proceeding with its excavation. The contractor shall not proceed with the excavation of such material until it has been cross-sectioned and classified by the Contracting Officer. Failure on the part of the contractor to uncover and expose such material, to notify the Contracting Officer, and allow time for cross-sectioning the undisturbed surface of such material will forfeit the contractor's right of claim to any classification other than that allowed by the Contracting Officer for the areas of work in which such materials occur.

c. Stripping. - Stripping shall consist of the removal of surficial materials judged by the Contracting Officer to be unsatisfactory for use as foundation materials or for use in the construction of fills which materials shall include sod, topsoil, stones, swamp deposits, organic materials, artificial fills, road pavements, base courses for pavements, all loose rocks on the surface, and other materials judged by the Contracting

Officer as objectionable. Stripping shall be unclassified excavation except for the removal of boulders or detached rock blocks measuring 2 cubic yards or more in volume which will be rock excavation.

3-04. UNCLASSIFIED EXCAVATION, GENERAL. - a. General. - Unclassified excavation, general, shall consist of the satisfactory removal, hauling to project features, hauling to and placement in stockpiles and spoil areas, of material removed by unclassified excavation from within the lines, grades, and slopes of all project work as shown on the drawings or as modified in the field by the Contracting Officer, except materials excavated from the borrow area or as otherwise specified in Section 1, "PREPARATION OF SITE". All excess and unsuitable materials removed by unclassified excavation, general, shall be disposed of in the spoil areas as specified in Paragraph 3-02. Excavation of materials downstream of the dam centerline, except excavations for the conduit and outlet channels, from which the random fill portion of the embankment will be constructed shall not be made prior to the diversion of the river.

b. Stripping. - Stripping shall be performed within the areas shown on the drawings and shall be limited in depth so as to remove only those surficial materials considered to be unsatisfactory for embankment fill material or unsuitable as a foundation material. Stripping operations shall be performed in such a manner as to salvage materials acceptable for processing for topsoil to the extent required as specified in Section 17, "TOPSOILING, SEEDING AND MULCHING". Only natural surface soil containing humus material shall be stockpiled. The Contracting Officer shall guide and control the extent and final depth of stripping and may direct the contractor to strip to limits and depths different from those shown on the drawings at no change in the contract unit prices. All earth slopes in the permanent work shall be topsoiled, seeded and mulched in accordance with the provisions of Section 17. No separate payment will be made for topsoiling, seeding and mulching the finished earth slopes, and all costs in connection therewith shall be considered a subsidiary obligation included under Item 4, "Unclassified Excavation - General".

c. Grading. - Parking area and other required areas shall be graded in accordance with the sections indicated on the drawings. Shoulders, ditches, side slopes, subgrades, and other designated areas shall be trimmed and dressed in a neat and workmanlike manner to the lines and grades shown on the drawings or staked in the field. The subgrade upon which road gravel will be placed shall be shaped to a uniformly even and regular grade in accordance with lines and grades indicated on the drawings or as determined in the field.

d. Excavation for Foundation Cut-Off. - (1) The trench excavation for the foundation cut-off shall be to the bottom widths, depths, and limits shown on the drawings except as otherwise specified herein.

Excavation shall be performed in a manner which will permit the placement and compaction of impervious fill in reaches at least 200 feet in length. The excavation shall extend to the bedrock surface. If the bedrock surface at any point in the excavation is encountered at a grade below that indicated on the drawings the contractor shall widen the excavation to full bottom width shown on the drawings by adjusting the downstream limit of the cut-off. The contractor shall be responsible for providing adequate means and provisions for completely dewatering the excavation areas for the entire reach in which foundation preparation; grouting, and placement of impervious fill is being accomplished and for producing and maintaining stable side slopes excavated to the lines shown on the contract drawings.

3-05. CLEANING OF BEDROCK SURFACES. - a. General. - The preparation of rock surfaces against which concrete is to be placed is specified in Subparagraph 3-07f. Bedrock surfaces in excavations for the conduit against which gravel fill or backfill is to be placed shall be cleaned of all dirt and loose displaced rock immediately prior to the placement of the gravel fill or backfill. The excavation at, and cleaning of, other bedrock surfaces shall be in accordance with the provisions in the following subparagraphs. Areas other than those designated shall be hand or machine cleaned as directed. All excavation required for the cleaning and preparation of the surfaces shall be paid for at the applicable contract unit prices for Item 4, "Unclassified Excavation - General", and Item 6, "Rock Excavation - General". In addition, payment for cleaning shall be made as stated elsewhere in this section.

b. Machine Cleaned. - The following areas of natural rock surfaces shall be "machine cleaned".

(1) Areas within the designated limits of "machine cleaned" areas of the foundation of the embankment as designated on the drawings.

(2) Areas within the excavation limits for the spillway, spillway channels, outlet conduit and intake and outlet channels below which rock is to be excavated for rockfill or rock slope protection materials. Areas of rock excavation where the rock is not suitable for rockfill or rock slope protection shall not be "machine cleaned". Machine cleaning shall consist of the removal of all earth and loose rock and rock fragments from the entire bedrock surface including areas of depression, large crevices, and large open joints. The material need not be removed in areas where the horizontal width of the openings are less than 16 inches. The degree of cleaning shall at least be equivalent to that obtainable with a toothless one-quarter yard backhoe dipper after the material has been loosened by prior operations. No rock excavation will be required to remove overhangs.

c. Hand Cleaned. - All areas of rock surfaces thus indicated on the drawings shall be "hand cleaned". Those portions of the areas where the concrete of the structures will be in contact with the rock shall not be "hand cleaned," but shall be prepared in accordance with the provisions of Subparagraph 3-07f. Hand cleaning of bedrock surfaces and rock surfaces produced by rock excavations shall consist of the removal of all earth, disintegrated bedrock, semi-detached or detached rock blocks and rock fragments from the entire bedrock surface including areas of depressions, crevices and joints. The bedrock surface shall be cleaned by washing or sweeping. In addition, all cracks, joints and crevices in the bedrock surfaces shall be thoroughly cleaned by use of jets of air or water or a combination thereof to the satisfaction of the Contracting Officer immediately prior to the placement of compacted gravel fill, compacted impervious backfill, compacted impervious fill and compacted gravel backfill thereon or in the preparation for the filling of these openings with mortar in areas to be covered with compacted random and impervious fill as specified in Section 5, "EMBANKMENT". Hand cleaning in the areas against which impervious or random materials are to be placed shall be accomplished after the special rock excavation at the surface as specified in Paragraph 3-07, has been done. Rock excavation will not be required at surfaces of rock upon or against which gravel fill or gravel backfill is to be placed.

3-06. UNCLASSIFIED EXCAVATION, BORROW. - a. General. - Unclassified excavation, borrow, shall consist of the satisfactory removal, hauling to the project features, hauling to and placement in stockpiles and spoil areas of materials excavated from the borrow area and removed by unclassified excavation as defined in Paragraph 3-03 of these specifications. Materials shall be excavated from the designated borrow area to the extent required to obtain suitable impervious fill materials. The Contracting Officer shall guide and control the stripping, removal of unsatisfactory surface materials, depths of excavation and the selection of material in the borrow area to obtain material meeting the specified requirements. Boulders and oversize stones removed during excavation shall be disposed of in the spoil area. Unless otherwise directed, the final excavation slope lines shall be 1 (vertical) on 3 (horizontal) extending downward from the limits shown on the drawings except as specified below. It is expected that bedrock will be encountered within the designated slopes. In areas where bedrock becomes exposed, the excavation areas shall be extended to the extent practicable so that the rock surfaces will form the excavation limits.

b. Clearing and Stripping. - The borrow area shall be cleared to its full extent. All clearing operations shall be as specified in Section 1, "PREPARATION OF SITE" for clearing operation at other locations. The borrow area shall be stripped only within the area of the limits of actual excavation. The depth of stripping shall not be extended in order to remove occasional or large roots which can be removed during placement of the fill materials.

c. Drainage. - Prior to the start of borrow excavations, the contractor shall construct ditches and embankments along the limits of excavation to prevent surface water from entering into the area of excavation. Additional drainage facilities shall be constructed in the excavation area to channel subsurface and rain water from areas of excavation operations. All operations in connection with drainage, including the filling of temporary ditches, shall be subject to the approval of the Contracting Officer and, if not considered adequately by the Contracting Officer, additional facilities shall be provided. Permanent interceptor ditches shall be constructed along the top of slopes at locations directed by the Contracting Officer. The depths, excavation slopes and exact locations of the permanent ditches shall be as directed in the field. Materials from these ditches shall be spoiled between the ditch and the excavation areas unless otherwise directed.

d. Grading. - The contractor shall grade all excavated portions of the borrow area so as to maintain these portions free of water during and after excavation. Upon completion of excavation operations in the borrow area, its surface shall be graded so as to leave reasonable uniform earth slopes and a neat bottom surface. The finished bottom of the excavation shall be uniformly graded to the satisfaction of the Contracting Officer and shall be approximately horizontal with grades to provide drainage no steeper than 10 percent. Bedrock surfaces exposed during borrow excavations shall be cleared to the extent feasible with bulldozers. The final earth excavation slopes shall be trimmed or graded with a bulldozer or similar equipment to provide finished slopes composed entirely of undisturbed natural soil. Filling on the slopes shall be limited to that required to fill erosion areas immediately prior to the placement of topsoil.

e. Placing Stripping Material. - Stripping material containing humus and organic materials, stockpiled as specified in subparagraph b above, shall be spread on excavation slopes and in the bottom of the borrow area. The stripping material shall be spread evenly to a loose thickness of 8 inches over the entire area of excavation, except that spreading of stripping material on extension areas of bedrock surfaces will not be required. All of the stockpiled stripping material shall be spread either on the slopes or on the bottom surface. All material which will interfere with placement, spreading and seeding operations shall be removed from the stripping material and disposed of as required for clearing. Fine grading of spread stripping material will not be required, however immediately prior to seeding, the spread stripping material shall be regraded to form a smooth even surface free of gullies and eroded areas. The spread stripping material shall be compacted by two coverages of the tread of a crawler type tractor. Stripping material, spread and otherwise treated as specified above, shall be fertilized, seeded and mulched as specified in Section 17, "TOPSOILING SEEDING AND MULCHING".

f. Sequence of Operations. - All operations shall be scheduled so that the construction of the embankment may proceed in accordance with the provisions of Section 5 "EMBANKMENT". The sequence of stripping and excavation operations in the borrow area shall be such that stockpiles and spoil piles can be placed within the excavated portions of the borrow area. Initial borrow explorations shall commence at the upper limit of the borrow area and will be carried to bedrock. Excavation will then proceed downhill and shall extend to bedrock except where drainage of depressed bedrock areas cannot be obtained by unclassified excavations.

3-07. ROCK EXCAVATION. - a. General. - The contractor shall excavate all rock at the locations of the dam, spillway, spillway approach, and discharge channel, conduit, and intake and outlet channels, and the Service Road, as required for the permanent works to the slopes, lines and grades shown on the drawings or as otherwise directed. The contractor will be required to submit a plan of operations showing the proposed size, spacing, depth of loading of all blast holes and to obtain the approval of the Contracting Officer before such work is started. Separate plans of operations showing the proposed method of rock removal will be submitted to the Contracting Officer for his approval prior to initiation of rock excavation at the locations of the conduit, intake and outlet channels and spillway weir and walls.

In areas of rock excavation, the rock surface shall be cleaned prior to rock excavation to prevent contamination of the excavated rock with overburden materials. The overburden removal shall include the required width of berms on the rock surface and shall be accomplished prior to the start of rock excavation. The rock surface on the berms shall be cleaned and maintained similarly to the rock surface in the areas of rock excavation. If, because of sloughing of overburden or overbreak on the sides of the rock excavations, the berms subsequently become narrower than design widths, the berms shall be re-established to design width and this width shall be maintained throughout construction operations to completion of the project.

b. Final Grades and Excavation Lines. - The inherent structural characteristics of the bedrock, its easy parting along foliation planes and the close and irregular joints pattern of the schist, granitic rocks and other bedrock at the site require that excavations be carefully made in approach to the grades and lines shown on the drawings. From observations of the breaking characteristics of the rock gained at the outset of the work and continuously as the excavation progresses, the charges used in blasting and the loading and spacing of drilled holes will be revised as necessary to prevent overbreak and shattering of rock outside the design slopes or grades. The blasting shall be performed only to the depth, amount and extent with explosives of such quantity and power as will break the rock to the lines and grades shown on the drawings and yet will not

fracture the rock, open incipient fractures, enlarge existing fractures, make the excavation unduly large or irregular, or cause other damage outside the prescribed limits of excavation. When, in the opinion of the Contracting Officer, damage is being done to the rock outside the prescribed limits of excavation, the contractor will be required to revise his drilling and blasting procedure to obtain sound slopes and grade lines and such revisions, if necessary, shall include the drilling of closely spaced holes at no additional cost to the Government. No holes for blasting shall be drilled more than two-thirds the depth of the proposed excavation over 15 feet. As excavations approach final lines and grades, the depth of holes for blasting and the amount of explosives shall be reduced progressively. Whenever, in the opinion of the Contracting Officer, blasting to grade or lines may damage the rock against which concrete is to be placed, excavation within 1 foot of lines and grades shall be done by drilling, chipping, barring, wedging, or similar methods in which explosives are not used and which will leave the foundation bed or side walls in a solid and unshattered condition. Whenever a bench or other horizontal surface is super-imposed upon a vertical or sloped face the excavation of the horizontal surface shall be completed before the vertical or sloped surface is begun in order to prevent loss of or damage either to the horizontal or the vertical or sloped face. Blasting for the bench excavation shall be carefully controlled to prevent damage to that rock which will subsequently form the vertical or sloped face. Where major incipient or open planes of cleavage or jointing are encountered which approximate and are behind the design slopes and present a potential slip or slide condition not amenable to bolting, excavation shall be made to these plans as directed by the Contracting Officer at applicable unit prices. The contract price for rock excavation shall include scaling of the side slopes.

The sides of all rock cuts will be carefully scaled of all loose and projecting rock as excavation progresses. Rescaling will be required at no additional cost to the Government as often as may be necessary to permit thorough inspection of the rock surface or whenever rock remaining in the side slopes loosens to the extent that it becomes a potential safety hazard.

c. Blasting. - Any damage by blasting done to the work or to properties beyond the limits of the work shall be repaired or otherwise satisfactorily cared for by the contractor at his expense. Blasting within 100 feet of concrete which has been in place less than 7 days will not be permitted under any circumstances, and blasting in the vicinity of concrete older than seven (7) days will be permitted only if approved by the Contracting Officer. Approval of the blasting plan showing methods of blasting or the strength and amount of explosives used will not relieve the contractor of his responsibility in connection with damages resulting from blasting operations.

d. Definition of Lines. - (1) Rock excavation on which concrete structures are to be placed shall be to the following lines. The "A" line is the line indicating the minimum thickness of concrete and therefore is the minimum excavation line and no excavation will be required beyond this line.

(2) The "B" payment line is located 12 inches outside the "A" line on the side slopes and 6 inches on horizontal surfaces as shown on the drawings. Payment for concrete and rock excavations will be made to the "B" lines as shown regardless of whether the limits fall inside or outside the lines.

(3) Where the foundation grade is to be determined during construction by the location of the rock surface and/or the condition of the rock at the surface or to a surface excavated to grade, payment at unit prices will be made for the actual quantities of rock removed and concrete placed to the surface as approved by the Contracting Officer. Such surfaces are delineated on the contract drawings by a note "maximum foundation grade". In the event that excavations for any structures should reveal that rock or other material encountered at design grades would provide unsatisfactory foundation, the excavation limits in the area shall be adjusted as necessary to provide an acceptable foundation. Necessary adjustments in foundation grade will be made by the Contracting Officer and will be furnished to the contractor in writing. Additional excavation and concrete quantities required by such adjustment will be paid for at the existing contract prices for these items.

e. Slides. - In the event of rock slides in any area of rock excavation which are determined by the Contracting Officer to be caused through no fault or negligence on the part of the contractor, the contractor will, in writing, be directed at the time at which the slide occurs to perform such corrective measures as are deemed necessary by the Contracting Officer and will be paid for at the contract unit price per cubic yard for Rock Excavation. Any slides not covered by a written directive by the Contracting Officer shall be removed and disposed of at no additional cost to the Government.

f. Rock Foundation Preparation. - (1) Concrete structures. - Rock surfaces upon or against which concrete is to be placed shall be prepared in accordance with Section 9, "CONCRETE".

(2) Embankment fill and backfill. - To the extent practicable and at the direction of the Contracting Officer, overhangs and abrupt, prominent protrusions of the rock surface in areas under the compacted impervious and random fill sections of the dam embankment to be hand cleaned shall be carefully removed by barring, wedging, drilling and light blasting to the surrounding general level to the rock surface. Surfaces upon or against which earth embankment fills or earth backfill is to be placed shall be cleaned as specified in Paragraph 3-05 for other rock surfaces.

g. Clean-Up For Inspection. - A cleaned-up condition shall be maintained during grouting operations to facilitate observations for leaks and their caulking. Clean-up shall consist of removal of all loose materials and water, followed by thorough cleaning of rock surfaces by jets of air, jets of water, or a combination of both as directed. Where questionable foundation conditions exist during excavation, a preliminary clean-up may be required for purposes of inspection over an area specified by the Contracting Officer. If, after clean-up, the foundation is found to be unsatisfactory, additional excavations shall be made as directed, and this procedure of excavation and inspection will be repeated until a satisfactory foundation is reached and at no increase in the unit price for such work.

3-08. SAFETY MESH. - Where directed by the Contracting Officer, the contractor shall after careful and thorough scaling of the excavation faces, provide a safeguard of wire mesh over rock faces in open cuts. In locations where concrete is not to be placed, the mesh shall extend from the top of rock excavation to bottom of rock excavation and shall be left in place until completion of all the work. In locations where concrete is to be placed, the mesh shall extend to an elevation 1 foot above the top of the first horizontal joint in the concrete to be placed. The mesh shall be removed progressively in advance of succeeding concrete placement to elevations 1 foot above each of the horizontal construction joints, being left in place during preparation for each concrete placement as long as possible consistent with proper clean-up of the rock surface, placement of reinforcement and embedded items and construction of forms. The mesh shall consist of 2 inch x 2 inch diamond mesh, No. 9 gage, galvanized steel wire chain link fencing fabric and shall be secured as shown on the drawings with rock bolts to the rock face as the excavation work progresses. The rock bolts for installation of the safety mesh shall be made of high strength steel and shall be of the square head type with leaf-type expansion shell and forged steel plug similar and approved equal to that manufactured by Bethlehem Steel Company. The bolts shall be 3/4 inch in diameter and a minimum of four (4) feet in length. Upon completion of all the work, the fabric shall be removed. The rock bolts, however, may be left in place. The contractor may provide an alternate method of protection subject to the approval of the Contracting Officer.

3-09. MEASUREMENT. - a. Unclassified Excavation, General. - Measurement for unclassified excavation, general, as defined in Paragraph 3-04, herein, to be paid for, will be by the cubic yard for the amount of material removed as unclassified excavation, general, and disposed of in accordance with these specifications. Areas from which materials are to be removed as unclassified excavation, general, will be surveyed immediately prior to commencement of the excavation. The survey will be made after clearing but prior to grubbing. All measurements will be based on this survey regardless of any changes which may occur in the areas during prosecution of the work. Measurements will be made between the grade and slope lines indicated on the drawings or staked in the field and the ground

surface as indicated by the survey. Wherever the excavation or stripping extends to a bedrock surface or to grades not definitely defined by lines shown on the drawings or staked in the field, a survey will be made of the rock surface or final grade to determine the lower limits of measurement for unclassified excavation, general. The volume to be paid for shall not include the volume of materials excavated below or outside the measured limits defined above except that which is specifically authorized to remove unsuitable foundation material. The volume of excavation to be paid for as unclassified excavation, general, shall not include the volumes of materials paid for or included under other items of work.

b. Unclassified Excavation, Borrow. - Measurement for unclassified excavation, borrow, as defined in Paragraph 3-06 of these specifications, to be paid for, will be made by the cubic yard for the amount of material satisfactorily removed as unclassified excavation, borrow, and disposed of in accordance with the specifications and drawings. A survey of the borrow area will be made after clearing and just prior to the beginning of stripping operations in the borrow area and all measurements for the excavation will be based on this survey without regard to any changes in the ground surface of the borrow area that may occur during the prosecution of the work. A survey of the borrow area will be made after completion of excavation and grading but prior to the placement of topsoil on the surfaces exposed by the excavation. Where the final borrow area contains spoil material, the final survey in the spoil area will be of the base surface of such material. Measurement for permanent interceptor ditches outside the limits of the excavation for borrow, shall be the volume between the ground and final surfaces as indicated by the above mentioned surveys. The volume of borrow to be paid for shall be the volume as measured above reduced by the volume of boulders excavated from the borrow area and classified and paid for as Rock Excavation - General.

c. Rock Excavation. - Measurement for rock excavation as classified in Paragraph 3-03 herein will be by the cubic yard of material satisfactorily removed by rock excavation and disposed of in accordance with the specifications and drawings. Quantities of bedrock excavated as rock excavation, including the removal of overhanging rock during foundation preparation will be measured in place as the volumes between the grades and lines indicated on the drawings, or as modified by the Contracting Officer, and the surface of the rock as indicated by the surveys specified in Paragraph 3-03, herein. The volume of rock to be paid for shall include the sum of the volumes of boulders and rock blocks classified as rock excavation. Only those blocks and boulders will be paid for which have been measured by the Contracting Officer.

d. Safety Mesh. - Measurement of safety mesh installed on rock surfaces will be made by the square yard which will be computed on the theoretical plane surface as defined by the excavation lines and grades shown on the drawings regardless of the final limits of actual excavation.

e. Machine Cleaned Bedrock Surfaces. - Measurement for machine cleaned bedrock surfaces as defined in Paragraph 3-05 of these specifications, to be paid for will be made by number of squares (a square being a unit of 100 square feet). The area of measurement for payment purposes will be the sum of the areas on horizontal planes produced by a vertical projection of the limits of the actual areas cleaned.

f. Hand Cleaned Bedrock Surfaces. - Measurement for hand cleaned bedrock surfaces as defined in Paragraph 3-05 of these specifications, to be paid for, will be made by the number of squares (a square being a unit of 100 square feet). The area of measurement for payment purposes for all work except as specified herein will be the sum of the areas on horizontal planes produced by a vertical projection of the limits of the actual areas cleaned. The measurement for payment for hand cleaning the side excavation slopes of the conduit will be the actual area of the slopes as determined by field surveys.

3-10. PAYMENT. - No payment will be made for excavation specified or indicated to be under other items of work.

a. Unclassified Excavation, General. - Unclassified Excavation, General, as defined and covered in this section of the specifications and measured in accordance with the provisions of Paragraph 3-09, above, will be paid for at the contract unit price per cubic yard for Item 4, "Unclassified Excavation - General". Such payment shall constitute full compensation for all work in connection with excavating, hauling, stripping, grading, stockpiling, rehandling from stockpiles, drainage, dewatering and pumping not paid for under other items, grading spoil areas, placement of materials in spoil areas, topsoiling, seeding and mulching of spoil areas and finished earth slope of the excavated areas, the stabilization of construction slopes and all other work specified herein in connection with unclassified excavation, general. Payment of Item 4, "Unclassified Excavation - General" shall not include payment for lowering the water table and dewatering for the foundation cut-off work which is to be paid for as part of the contract lump sum price for Item 3, "Control and Diversion of Water".

b. Unclassified Excavation, Borrow. - Unclassified excavation, borrow, as defined and covered in this section of the specifications and measured in accordance with the provisions of Paragraph 3-09, above, will be paid for at the contract unit price per cubic yard for Item 5, "Unclassified Excavation - Borrow". Such payment shall constitute full compensation for all work in connection with clearing, stripping, excavations, hauling, disposal of spoil materials, grading, drainage, stockpiling, and rehandling of stockpiled materials, spreading of stripping materials, seeding and mulching in the excavated areas, and all other work specified in connection with unclassified excavation, borrow.

c. Rock Excavation. - Rock excavation as defined and covered in this section of the specifications and measured in accordance with the provisions of Paragraph 3-09 above, will be paid for at the contract unit price per cubic yard for Item 6, "Rock Excavation - General". Such payment shall constitute full compensation for all work in connection with drilling, blasting, excavation, hauling, and disposal of waste and spoil materials, stockpiling, rehandling from stockpiles, cleaning excavated surfaces, scaling, breaking of rock to specific sizes, and all other work specified herein in connection with rock excavation which is not paid for under other items.

d. Safety Mesh. - Safety mesh as defined in this section of the specifications and measured in accordance with the provisions of Paragraph 3-09, above, will be paid for at the contract unit price per square yard for Item 8, "Safety Mesh". Such payment shall constitute full compensation for furnishing material and bolts and performing all work in connection with placement and removal of safety mesh, and removal and disposal of all rock dislodged by the removal of safety mesh. Where rock bolts in excess of 4 feet in length are required, excess length will be paid for at the established price of two dollars ($2.00) for each additional foot required above the specified length.

e. Machine and Hand Cleaned Rock Surfaces. - Machine cleaned bedrock surfaces and hand cleaned bedrock surfaces as defined and covered in this section of the specifications and measured in accordance with the provisions of Paragraph 3-09, above, will be paid for at the applicable contract unit prices per 100 square feet (square) for Item 10, "Machine Cleaned Bedrock Surfaces", and Item 11, "Hand Cleaned Bedrock Surfaces". Such payment shall constitute full compensation for scraping, cleaning, washing, sweeping, cleaning with jets, all work in excess of that usually required for unclassified excavation, general, and rock excavation, and all other work required to obtain the specified results. In addition, the contract unit price for "Hand Cleaned Bedrock Surfaces" shall include all costs in connection with filling joints and cracks in bedrock surfaces, as specified in Paragraph 5-05b, including furnishing of all cement, sand and water, mixing and placing of mortar and removal of excess mortar from surfaces, and all other incidental work required for filling the cracks and joints. Such payments do not include compensation for the preparation of rock surfaces upon which concrete is placed.

SECTION 4

ROCK BOLTING
(Item 9)
(Index)

SECTION 4

ROCK BOLTING
(Item 9)

4-01. GENERAL. - a. Scope. - The work covered by this section of the specifications consists of furnishing all labor, plant, power equipment and materials and performing all operations in connection with drilling holes and installing rock bolts.

b. Program. - The work contemplated consists of installing rock bolts in the sides of rock cuts, and elsewhere as directed for protection from and prevention of rock falls and slides. The amount of rock bolting shown in the schedule is tentative. Actual requirements will be governed by conditions encountered as the work progresses. The Government reserves the right to increase or decrease the quantities shown in the schedule, and the contractor will not be allowed any increase in unit prices by reason of any changes in the amount of work or materials involved.

c. Procedures. - The areas to be bolted and the location and orientation of the bolts will be determined in the field and shall be as directed by the Contracting Officer. To aid in the determination of areas where rock bolting may be required and to insure proper application, removal of loose rock, thorough scaling of rock surface and cleanup of the excavation shall be done as necessary. The use of rock bolts will not be construed to imply they will serve as substitutes for proper scaling.

4-02. DRILLING EQUIPMENT. - All drilling equipment used shall be of a type, capacity and mechanical condition suitable for doing the work, as determined by the Contracting Officer.

4-03. ROCK BOLTS AND ACCESSORIES. - a. Bolts. - Bolts shall be made of high strength steel and shall be of the square head type with leaf-type expansion shell and forged steel plug similar and approved equal to that manufactured by Bethlehem Steel Company. The bolts, except where longer bolts are directed to be installed, shall be eight (8) feet in length, and 3/4 inch in diameter.

b. Plates and Washers. - Steel bearing plates shall be flat 6 x 6 x 3/8 inches with holes centrally punched. Angle washers shall be employed as necessary to provide a bearing surface normal to bolts which are not installed normal to the rock face. Hardened steel washers at least 1/8 inch thick shall be used between the bolt heads and the flat bearing plates or angle washers.

4-04. INSTALLATION. - a. General. - Holes for bolts shall be carefully drilled to the depth and diameter recommended by the manufacturer of the rock bolts to insure proper wedging and anchorage. Immediately prior to placing rock bolts, the area to be supported shall be scaled as necessary to assure protection from falling rocks and provide adequate seating of the plate against rock suitable for the purpose. Bolts shall be installed as recommended by the manufacturer. The bolts shall be tightened with a calibrated pneumatic impact wrench to a torque of 150 to 175 foot-pounds. The effectiveness of such tightening shall be checked by use of a torque wrench furnished by the contractor for such purpose. Such wrench shall be of an acceptable type, capable of measuring from 0 to 300 foot-pounds. Checking shall be as directed and occasional rechecking of torque on the rock bolts will be required. Bolts which become ineffective because of rock ravelling or fall-out or from any other cause shall be removed or cut off at the rock surface.

4-05. MEASUREMENT AND PAYMENT. - Measurement will be made by the number of 8-foot long bolts furnished and installed complete in place. This will include bolts that were installed complete and later have become ineffective through subsequent blasting operations. Payment will be made at the established contract unit price each as indicated on the unit price schedule for Item No. 9, "Rock Bolting," which price shall include payment for all expenses necessary to complete the work specified, including cutting or removal of bolts which have become ineffective. In the event longer bolts than specified are required, payment will be made at the established price of Two Dollars and No Cents ($2.00) for each additional foot required above the specified length in subparagraph 4-03a. All work in connection with furnishing and installing rock bolts for safety mesh will be included and paid for under Item No. 8, "Safety Mesh" as specified elsewhere in these specifications.

SECTION 5

EMBANKMENT
INDEX

SECTION 5

EMBANKMENT
(Items 12 thru 19, incl.)

5-01. SCOPE. - The work covered by this section consists of furnishing all plant, labor, equipment, and appliances, and of performing all operations in connection with the preparations of foundations for embankments and backfills and the placement and compaction of all materials in the embankment and backfills, except as hereinafter provided, in strict accordance with the contract drawings and specifications and subject to the terms and conditions of the contract. The provisions in this section of the specifications are applicable for portions of the embankment constructed of rock fill, rock slope protection, road gravel, gravel bedding, and Bubble Gage Shelter fill, except as otherwise specified in Section 6, "ROCK FILL, ROCK SLOPE PROTECTION, GRAVEL BEDDING, AND ROAD GRAVEL" and Section 11, "BUBBLE GAGE SHELTER".

5-02. DEFINITIONS. - a. Embankment. - The term "embankment" as used in these specifications is defined as including all portions of the dam, exclusive of backfills and concrete structures, between the top of dam, the outer slope lines, and the foundation surfaces after stripping and required excavations. The foundation cut-off is considered as part of the embankment under this definition.

b. Backfill. - The term "backfill" as used herein is defined as fill material placed adjacent to or over concrete structures in areas (1) where heavy or large equipment is not permitted to operate in order to avoid damage to these structures, and (2) where heavy or large equipment cannot operate due to space limitations. The types of backfill include "compacted impervious backfill", and "compacted gravel backfill."

c. Compacted Backfill. - The term "compacted backfill" as used herein is defined as backfill material deposited in thin layers and compacted with power tampers or surface vibrators as specified. All backfill material shall be compacted unless otherwise directed or designated on the drawings.

d. Special Impervious Fill. - The term "special impervious fill", is defined as impervious fill adjacent to certain steep surfaces of walls and bedrock and in depressions in bedrock surfaces which is composed of impervious fill material placed in thin layers by hand and compacted with power tampers in order to insure a very tight contact between the fill and the structure or bedrock surface and to insure satisfactory compaction of the fill material in the vicinity of the surface. Special impervious fill is the same as compacted impervious backfill except that (1) the operation of heavy compaction equipment shall extend into the zone of special impervious fill during the compaction of the adjoining fill material and (2) that heavy construction equipment may operate within that zone.

5-03. GENERAL PROVISIONS. - a. Lines and Grades. - (1) General. - The embankment sections and backfill sections shall be constructed to the lines, grades, and cross sections indicated on the drawings or as defined herein unless otherwise directed by the Contracting Officer. All fills and backfills shall extend to the bottom and slopes of an excavation regardless of the location of the payment or excavation lines shown on the drawings. The Government reserves the right to increase or decrease the foundation in widths or the slopes of any embankments, or to make such other changes in the fill and backfill sections as may be deemed necessary to produce safe and satisfactory structures or to utilize materials available from required excavations to the maximum extent possible. Increases in the height of embankment to compensate for shrinkage or consolidation of the embankment materials subsequent to completion of the embankment will not exceed five (5) percent of the height above the foundation indicated on the drawings. Changes in quantity of materials resulting from prescribed changes in section shall not be made cause for claims for increased unit prices.

(2) Gravel Fill on Bedrock. - It is anticipated that the bedrock surface upon which compacted gravel fill is to be constructed may be too uneven to make it practicable for the construction of a layer of the thickness specified in the drawings. During the progress of the work, the Contracting Officer will establish the grades and elevation of the surface of the compacted gravel fill to provide as near as practicable a layer of the specified thickness. The limits will be established so that at least 12 inches of gravel fill is constructed over the high points.

b. Conduct of Work. - The contractor shall maintain and protect all excavations, foundation areas, backfills, and uncompleted portions of the embankment in a satisfactory condition at all times until final completion and acceptance of all work under the contract. Any approved fill or backfill material which is lost in transit or rendered unsuitable after being placed in a fill or backfill section and before final acceptance of the work shall be replaced by the contractor in a satisfactory manner and no additional payment will be made therefor, when such loss or damage is due to causes that are considered avoidable and are under the control of the contractor. The contractor shall excavate and remove from sections of fill and backfill any material which the Contracting Officer considers objectionable and shall also dispose of such material and refill the excavated area as directed, all at no cost to the Government, unless the objectionable material is in place through no fault of the contractor, in which case payment will be made for the borrow excavation and disposal of such material at the applicable contract unit price for excavation, and the refilling of the excavation will be paid for at the applicable contract unit price for fill. The contractor may be required to remove, at his own expense, any material placed outside of the prescribed slope lines.

c. Haul Roads. - Haul roads shall be located and constructed as approved by the Contracting Officer. They shall be designed to maintain the intended traffic, to be free draining and shall be maintained in good condition throughout the contract period. The contractor may not use materials from required and borrow excavations for the construction of haul roads and construction areas except those materials specifically designated to be placed in spoil areas. No separate payment will be made for the construction of haul roads and other work incidental thereto, the cost of which will be considered as a subsidiary obligation of the contractor.

5-04. MATERIALS. - a. General. - (1) Materials from Required Excavations and Borrow Excavations. - Materials for random and impervious fills and impervious backfills shall be obtained from the required excavations and from the borrow area indicated on the drawings. The intention is to utilize suitable material from the required excavations to the extent possible so as to minimize the need for required borrow. Except as stated in Section 3, "EXCAVATION", materials to be spoiled will be specifically designated by the Contracting Officer at the time the material is excavated. Materials containing brush, roots, sod, or other perishable materials will not be considered suitable. Materials otherwise suitable except for roots shall be used for fill or backfill after the roots are removed. The suitability of the fill materials shall be subject to the approval of the Contracting Officer and their disposition in fill and backfill sections will be as directed by the Contracting Officer. The contractor shall excavate in the borrow area in the locations determined by the Contracting Officer whenever such control is necessary to obtain the type of material required for the embankments. If directed by the Contracting Officer, the contractor shall excavate pits within the limits of the borrow area and areas adjacent thereto for the purpose of exposing material, at no additional cost to the Government. Mixing of materials during the excavating process in the borrow area and the required excavation may be required to the extent possible with the type of equipment being used. No source of material will be rejected as the result of the material in place containing oversize stones. Oversize stones in fill and backfill materials, as defined in other paragraphs in this section shall be removed from the materials prior to compaction or during placement where compaction is not required.

(2) Materials Furnished by Contractor. - The following standards of the American Society for Testing and Materials form a part of this specification for materials to be furnished by the contractor:

D75-59	Sampling Stone, Slag, Gravel, Sand and Stone Block for Use as Highway Materials.
C136-61T	Test for Sieve or Screen Analysis of Fine and Coarse Aggregates.

D421-58 Dry Preparation of Samples for Grain Size Analysis and Determination of Soil Constants

D422-61T Grain Size Analysis of Soils.

Materials for pervious fill, gravel fill and backfill, and processed sand fill material shall be furnished by and at the expense of the contractor from approved sources. These materials shall consist of tough, durable particles and shall be reasonably free from thin, flat and elongated pieces and shall contain no organic matter, sod, roots, brush, debris or soft friable particles in quantities considered objectionable by the Contracting Officer. The sources from which the contractor proposes to obtain any of the materials covered in this subparagraph shall be selected well in advance of the time when the material will be required in the work. Unless otherwise directed, suitable samples of the material for testing from any source selected by the contractor shall be submitted to the Contracting Officer for approval prior to the delivery of the material to the site of work from the source. Unless otherwise specified, all test samples for material shall be obtained by the contractor and delivered at his expense to a point designated by the Contracting Officer at least 30 days in advance of the time when the placing of the material is expected to begin. Sampling of the materials shall be done by the contractor in accordance with ASTM D75-59 at his own expense and in the presence of a representative of the Contracting Officer. The samples shall be subjected to such tests as are necessary to determine the acceptability of the material for use in the work unless suitable test reports and/or service records are available that are satisfactory to the Contracting Officer. All tests will be made by, or under the supervision of, the Government and at its expense. The approval of a material by the Government based on test results, examination of the materials exposed at the source, and service records shall not relieve the contractor, in any way, of the responsibility of placing a material which meets the requirements specified herein. Approval of a material from a source shall not be construed as approval of all materials from that source. The right is reserved to reject, at any time, any or all portions of the materials in the source when such materials are unsuitable in the opinion of the Contracting Officer. During or after placement of contractor furnished materials, test samples will be taken and tested to determine gradations of the materials in accordance with ASTM C136-61T, D421-58 and D422-61T. Such sampling and testing will be done by the Government. All or any portions of contractor-furnished material placed which is not of approved quality or which does not have the specified gradation shall be removed at no additional cost to the Government.

(3) Sources of Contractor-Furnished Materials. - (a) Several off-site deposits of sands and gravels have been investigated to determine the suitability and availability of materials for pervious fill, gravel fill and gravel backfill. Samples were taken of the exposed materials from pit faces which appeared to contain suitable materials. These investigations showed that there are several deposits in the Naugatuck River Valley,

southwest of Thomaston, Connecticut and northeast of Waterbury, Connecticut. The materials in the deposits tested have satisfactory quality. To obtain various types of fill material from these deposits will require proper selection to obtain materials with the desired gradations. In addition there are commercial concrete aggregate producers in Waterbury, Connecticut and vicinity that can produce materials that meet the requirements for processed sand fill material as specified in Subparagraph 5-04f. Information relative to these investigations and tests are on file at the Headquarters, U.S. Army Engineer Division, New England, Waltham, Massachusetts, and are available for inspection in accordance with the requirements of the SPECIAL CONDITIONS.

b. Impervious Fill. - Impervious fill material to be used in the construction of the dam embankment shall consist of approved material obtained from the borrow area. The Contracting Officer will be the sole judge of the suitability of any material and will direct the borrow excavation operations accordingly.

c. Random Fill. - Random fill material for use in the construction of the dam embankment shall consist of approved materials obtained from the required excavations, in accordance with Section 3. Except that when it has been determined by the Contracting Officer that all available material from the required excavations for the downstream embankment foundation has been utilized, approved material from the borrow area shall be utilized as random fill.

d. Pervious Fill. - Pervious fill material shall consist of material meeting the requirements for gravel fill specified below or bank-run, reasonably well graded, sand or gravelly sand furnished by the contractor from approved sources and from which all oversize stones, as defined by subparagraph 5-06g(1), has been removed either at the sources or during spreading. Pervious fill material shall conform to the following gradation requirements.

(1) At least 60 percent, by dry weight, of the particles shall pass the No. 4 U. S. Standard Sieve.

(2) Of the component passing the No. 4 U. S. Standard Sieve, no more than 15 percent, by dry weight, of the particles shall pass the No. 200 U. S. Standard Sieve.

e. Gravel Fill. - Gravel fill material shall consist of reasonably well-graded bank-run sandy gravel or gravelly sand furnished by the contractor from approved sources and from which all oversize stones, as defined in subparagraph 5-06g(1), has been removed either at the sources or during spreading. Gravel fill shall not contain more than 50 percent, by dry weight, of stones larger than 3 inches in maximum dimension.

Gravel fill material shall conform to the following gradation requirements:

(1) Of the component of the material passing the 3-inch U. S. Standard Sieve, at least 25 percent and no more than 60 percent, by dry weight, of the particles shall pass the No. 4 U. S. Standard Sieve.

(2) Of the component of the material passing the No. 4 U. S. Standard Sieve not more than 15 percent, by dry weight, of the particles shall pass the No. 200 U. S. Standard Sieve.

f. Processed Sand Fill. - Processed sand fill material shall consist of materials furnished by the contractor from approved sources and meeting the gradation specification for fine concrete aggregate as provided in Section 9, "CONCRETE."

g. Backfill. - Materials for impervious and gravel backfills shall be obtained from the same sources as specified for the corresponding fill materials and shall meet all requirements for these materials except that the maximum stone sizes will be as specified in subparagraph 5-06g(1) of this section.

5-05. PREPARATION OF FOUNDATION. - a. Earth Foundations for Embankments. - This paragraph covers the preparation of the foundation areas for embankments to be constructed on earth foundations. After stripping to approved depths of each area of the embankment foundation (except areas of excavations for the foundation cut-off) the sides of stump holes, previous excavations, and other similar cavities or depressions within the stripped area shall be broken down so as to flatten out the slopes and the sides of the cuts or holes. Each depression in the foundation areas of the compacted impervious fill section and the compacted random fill section shall be filled with impervious fill material and random fill material, respectively. The impervious and random fill material shall be placed in layers moistened and compacted in accordance with the applicable provisions of Paragraphs 5-06, 5-07, and 5-08 of this section. After filling of depressions and immediately prior to placement of embankment material in areas outside the limits of the foundation cut-off, the foundation soil shall be loosened thoroughly by scarifying, plowing, or harrowing to a depth of 8 inches, except where the slope of the foundation surface is steeper than 1 vertical on 4 horizontal and except in areas where this requirement is waived by the Contracting Officer. After the removal of roots and other debris turned up by the loosening process, the loosened surface of the embankment foundation area shall be completely dewatered and shall be compacted by 10 complete passes of the compaction equipment as hereinafter specified for the compaction of impervious and random fill material. Where the slope of the foundation surface is steeper than 1 vertical on 4 horizontal in areas outside the limits of the foundation cut-off, the foundation surface shall be compacted by the overlapping of the rolling of the contiguous horizontal

layers of fill material onto it in such a manner as to produce a number of coverages of the foundation surface equal to at least twice that required for the adjacent fill material. No separate payment will be made for loosening, scarifying, dewatering, and rolling the foundation areas, but the entire cost thereof shall be included in the contract unit price for the adjacent embankment materials.

b. Bedrock Foundations for Embankments. - Bedrock surfaces upon or against which embankment materials are to be placed shall be cleaned in accordance with the provisions of Section 3, "EXCAVATION". Prior to the placement of impervious or random fill materials on or against bedrock, all open joints and cracks within the area of contact of hand cleaned surfaces shall be filled to the depths cleaned, with mortar composed of one (1) part of portland cement and two (2) parts sand. The sand shall conform to Federal Specification SS-A-231b and shall have a gradation within the following limits:

U. S. Standard Sieve	Percent Passing by Dry Weight
No. 8	100
No. 16	95-100
No. 30	60-85
No. 50	20-50
No. 100	10-30
No. 200	0-5

Sand for mortar to fill cracks and joints greater than 1/2-inch in width may be as specified for fine concrete aggregate in Section 9, "CONCRETE." The consistency of the mortar and the methods and devices used for the placement of mortar shall be such as to insure complete filling to the satisfaction of the Contracting Officer. In no case shall a thin coat of mortar be left to cover any portion of the bedrock surface. The foundation areas of the embankments shall be completely dewatered during placement of fill materials.

c. Backfill. - Prior to the placement of backfill material all mud, stones, lumber, and other debris shall be removed from the foundation area to the satisfaction of the Contracting Officer and the foundation shall be completely dewatered. Bedrock surfaces against which backfill materials are to be placed shall be prepared as specified in subparagraph b, above for corresponding fill materials.

5-06. PLACEMENT OF FILL MATERIALS. - a. General. - The placement of rock fill, rock slope protection, gravel bedding, and road gravel materials shall be in accordance with Section 6, "ROCK FILL, ROCK SLOPE PROTECTION, GRAVEL BEDDING, AND ROAD GRAVEL" and is not covered by this paragraph. No fill material shall be placed on any part of any embankment foundation area until the area has been inspected and approved by the Contracting Officer. No fill shall be placed against concrete structures until the concrete has

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been in place at least 14 days. No fill or backfill material shall be placed in any area inundated with water. The gradation and distribution of materials throughout any fill section of the embankments shall be such that the section will be free from lenses, pockets, streaks, and layers of material differing substantially in texture or gradation from surrounding material in the same section. Successive loads of material shall be dumped at locations on the fill as directed or approved by the Contracting Officer. No fill material shall be placed upon a surface of frozen material, nor shall snow, ice, or frozen material be incorporated into any fill section. No fill material shall be placed on previously placed fill material which, in the opinion of the Contracting Officer, has been affected by frost until the surface of the previously placed material has been loosened and recompacted as specified in Paragraph 5-05, above, for earth foundation preparation. No fill material shall be placed in an area within which compaction equipment is being operated. Layers of fill materials which are to be compacted shall be placed and spread over areas large enough to permit an orderly pattern for operating compaction equipment.

b. Rate and Sequence of Placement. - The dam embankment shall be constructed in such a manner that the area of placement of materials will be approximately horizontal and shall extend for the full width and full length of the embankment at the elevation of the working surface regardless of the number of different fill materials required except as follows:

(1) All or a portion of the height of the compacted random fill section below Elevation 510 shall be constructed prior to other fill sections in order that all approved available random fill material obtained from the required excavations for the downstream embankment foundation may be utilized in the embankment construction, except that impervious fill material may be placed below elevation 510 upstream of the compacted random fill section.

(2) The zones of compacted gravel fill and compacted processed sand fill may be constructed ahead of the adjoining fills.

(3) The fill material for the compacted pervious fill section shall be placed at least 1 foot and no more than 3 feet vertically in advance of the adjacent fill sections. To accomplish this, portions of the pervious fill material may overlap as necessary into the adjoining fill area but shall not extend a distance of more than 5 feet.

(4) Fill material may be placed in the foundation cut-off prior to the construction of the adjoining fills. Where this is accomplished the fill material shall be placed in the foundation cut-off in reaches of at least 200 feet in length.

c. Impervious Fill. - Impervious fill material shall be placed in the compacted impervious fill sections of the embankment including the foundation cutoff. When, in the opinion of the Contracting Officer, all available and approved random fill from the required downstream excavations has been utilized in the random fill section of the embankment, impervious fill material shall be utilized as random fill and shall be placed in the random fill section of the embankment.

d. Random Fill. - Random fill material shall be placed in the compacted random fill section of the embankment. All available and approved random fill material obtained from the required excavations for the downstream embankment foundation shall be placed in the compacted random fill section of the embankment. The compacted random fill section of the dam has been established to insure the use of all available random fill material and additional material may be required for the completion of the random fill section of the dam. After all available random fill material has been utilized in the construction, the compacted random fill section of the dam will be completed with compacted impervious fill. In no case shall impervious fill material be placed in the compacted random fill section until all available random material has been utilized.

e. Pervious Fill. - Pervious fill material shall be placed in the compacted pervious fill sections of the embankment. Care shall be exercised in the placement of pervious fill material to prevent its contamination by material from adjacent fill sections during and after placement. A maximum tolerance of 5 feet measured horizontally beyond the limits of the pervious fill section will be allowed as necessary to permit placement of the materials in accordance with subparagraph b. above.

f. Gravel Fill and Processed Sand Fill. - Gravel fill and processed sand materials shall be placed in the compacted gravel fill and compacted processed sand fill sections, respectively, of the embankment indicated on the drawings. Care shall be exercised to prevent contamination of these materials during and after placement by material from adjacent fill sections.

g. Spreading. - (1) General. - This paragraph covers the requirements of spreading, placing and preparation of layers for compaction for fill materials, in general. Requirements for fill material to be placed in restricted areas on uneven bedrock surfaces and for special impervious fill materials are stated in Subparagraphs (2), (3), (4), and (5) below. After dumping, the material for a fill section shall be spread by bulldozers or other approved means in approximately horizontal layers over the entire fill area, except that the layers of gravel fill and processed sand fill material, may be placed and compacted on the abutment slopes prior to the construction of the adjoining fill where practicable. The thickness of each layer before compaction with a tamping type roller, rubber-tired roller, or tractor only shall not be more than 8, 12 and 6 inches, respectively. No fill material shall be dumped or spread with mechanical equipment within areas of "special impervious fill",

or "backfill." As soon as practicable after commencement of construction of the embankment, the central portion thereof shall be raised or crowned with grades not to exceed 10 percent so that the surface of the fill will drain freely and shall be so maintained throughout construction. If the compacted surface of any layer of compacted fill is determined to be too smooth to bond properly with the succeeding layers, it shall be loosened by harrowing, or by any other approved method before the succeeding layer is placed hereon. During the dumping and spreading processes, the contractor shall maintain, at all times, a force of men and equipment adequate to remove all roots and debris from all fill materials and all stones with a maximum dimension greater than 2/3 of the thickness of the loose random or impervious fill layer from which the stones are being removed and all stones with a maximum dimension greater than the thickness of the loose layer of other fills from which the stones are being removed. Stones so removed shall be picked up on the fill area and shall be placed directly in the rock fill sections of the structures. Rock rakes or bulldozers shall not push the stone into place. At no time shall piles of oversize rocks be temporarily left within the limits of the foundation area and lines of the embankment. Roots and debris shall be removed from the embankment and disposed of in an approved manner. The entire surface of any section of an embankment under construction shall be maintained in such condition that construction equipment can travel on any part of any one section. Ruts in the surface of any layer shall be filled satisfactorily before compacting. Random, pervious, gravel, and impervious fill materials are to be placed adjacent to walls and bedrock surfaces except where special impervious fill or backfill are shown on the drawings or as directed by the Contracting Officer. During the placement or spreading of fill material adjacent to walls or bedrock surfaces, special care shall be taken to place only friable fill material, free of clods, and nested stone within 18 inches of the wall and bedrock surface. At no time shall the surface of a layer of fill adjacent to special impervious fill be above the surface of the special impervious fill.

(2) Restricted Areas. - In areas such as ditches, depressions, excavated areas with limited widths which, in the opinion of the Contracting Officer, are too restricted for the operation of the required roller to compact the random, pervious, gravel or impervious fill materials, the fill material shall be placed as specified in subparagraph (1) above, except that the thickness of layers shall not be greater than 4 inches and except as otherwise provided herein. These areas do not include areas defined in the following subparagraph.

(3) Impervious and Random Fill on Uneven Bedrock. - It is anticipated that portions of the bedrock surface exposed by stripping operations between the foundation cut-off of the dam and the upstream limit of the compacted pervious fill zone after preparation in accordance with Paragraph 5-05, will be too uneven to permit satisfactory placement and compaction of the fill material in accordance with subparagraph (2), above. Where such is the case, the Contracting Officer will direct the placement

and compaction operations, utilizing a small bulldozer or similar equipment for placement and the specified light weight tractor for compaction. Placement in thicknesses greater than 4 inches with increased compactive effort may be directed in deep troughs and pockets in the bedrock surface. Hand placement may be directed in limited areas where mechanical methods are not suitable. In deep depressions of limited width and length and in other limited areas where in the opinion of the Contracting Officer, adequate compaction of the impervious fill material cannot be obtained by the methods described above, placement of special impervious fill in accordance with Paragraphs 5-09 and 5-10 will be directed. Except for the special impervious fill, hand compaction will not be required.

(4) Gravel Fill on Uneven Bedrock. - It is anticipated that portion of the bedrock surface upon which compacted gravel fill is to be placed after preparation in accordance with Paragraph 5-05 will be too uneven to permit satisfactory placement and compaction of the gravel fill material in accordance with Subparagraph (2), above. Where such is the case, the Contracting Officer will direct the placement and compaction operations, utilizing a small bulldozer or similar equipment for placement and the specified lightweight tractor for compaction. Placement in thicknesses greater than 4 inches with increased compactive effort may be directed in deep troughs and pockets in the bedrock surface. In order to reduce the required amount of compactive effort, saturation of portions of the gravel fill material during compaction will be directed. Hand compaction of gravel fill placed on uneven bedrock surface will not be required.

(5) Special Impervious Fill. - The placing and spreading of special impervious fill material adjacent to certain walls and steep rock faces and the placing and spreading of initial layers of impervious fill material against certain areas of bedrock foundations shall be as specified in Paragraphs 5-09 and 5-10 of this section, respectively.

5-07. MOISTURE CONTROL OF COMPACTED FILL MATERIALS. - The materials in each layer of fill material to be compacted shall contain the amount of moisture, within the limits specified below or as directed by the Contracting Officer, necessary to obtain the desired compaction as determined by the Contracting Officer.

a. Compacted Impervious and Random Fills. - The moisture content shall be as uniform as practicable throughout any one layer of impervious or random fill material immediately prior to and during compaction. The upper and lower limits of moisture content shall be within 2 percentage points of the optimum moisture content as determined by the Contracting Officer. It is anticipated that some of the random and impervious fill materials will have natural moisture contents greater than the specified upper limit for placement. Drying back of impervious and random fill materials will be required by such methods as spreading the material on the fill area to dry, aerating the material by discing and harrowing either

at the source or on the fill, excavating drainage trenches at the source, in accordance with Section 3, "EXCAVATION" or other methods that will reduce the moisture content to an amount within the specified limits. Prior to the placement of any fill material, the contractor shall place on the project at least one heavy-duty 24-inch road disc harrow similar to Model D36-1-F offset disc, manufactured by the Towner Manufacturing Company, Santa Ana, California. When the materials are too dry, the contractor will be required to moisten each layer of the fill. Disc harrowing, or other approved methods, will be required to work the moisture into the material until a uniform distribution of moisture is obtained. Water applied on a layer of fill shall be accurately controlled in amount so that free water will not appear on the surface during or subsequent to rolling. Should too much water be added to any part of the embankment, so that the material is too wet to obtain the desired compaction, the rolling and all work on that section of the embankment shall be delayed until the moisture content of the material is reduced to an amount within the specified limits. If, in the opinion of the Contracting Officer, the top or contact surface of a partial fill section has become too dry to permit suitable bond between this surface and the additional fill material to be placed thereon, the contractor shall loosen the dried materials by scarifying or discing to such depths as may be directed by the Contracting Officer, shall dampen the loosened material to an acceptable moisture content, and shall compact this layer in accordance with the applicable requirements of Paragraph 5-08, below.

b. Compacted Pervious, Gravel and Processed Sand Fills. - The moisture contents of materials for pervious fill, gravel fill, and processed sand being compacted shall be such as to prevent excessive rutting and dust and to permit satisfactory operation of the hauling and compacting equipment.

5-08. COMPACTION OF FILL MATERIALS. - a. Equipment. - Compaction equipment shall conform to the following requirements and shall be used as prescribed in subsequent paragraphs.

(1) Tamping Rollers. - Tamping rollers shall consist of a heavy duty double drum unit with a drum diameter not less than 60 inches and an individual drum length of not less than 60 inches. The drums shall be ballasted with water or sand and water. Each drum shall have staggered feet uniformly spaced over the cylindrical surface such as to provide approximately three tamping feet for each two square feet of drum surface. The tamping foot shall be 7 to 9 inches in clear projection from the cylindrical surface of the roller and shall have a face area of not less than 5 nor more than 7 sq. in. The roller shall be equipped with cleaning fingers, so designed and attached as to prevent the accumulation of material between the tamping feet, and the cleaning fingers shall be maintained at their full length throughout the periods of use of the roller. The weight of the roller shall not be less than 2500 pounds per foot of linear drum length weighted, and shall not be more than 1500 pounds

per foot of drum length empty. The design and operation of the tamping roller shall be subject to the approval of the Contracting Officer who shall have the right at any time during the execution of the work to direct such repairs to the tamping feet, minor alterations in the roller, and variations in the weight as may be found necessary to secure optimum compaction of the earth fill materials. At the start of compaction operations, the drums of the rollers shall be full of water. Placement of the embankment materials shall not commence unless every tamping foot of every roller to be used has a plane surface area as specified by the manufacturer of each roller. If, during the placement of fill the plane surface area of any tamping foot on a roller becomes equal to or less than two-thirds of the manufacturer's specified area, the use of the roller shall not be permitted until the plane areas of all tamping feet on the roller are restored to the manufacturer's specified area. The roller shall be pulled by a crawler-type tractor of sufficient power to operate the roller at a speed of approximatly 3 miles per hour.

(2) Rubber-Tired Rollers. - Rubber-tired rollers shall have a minimum of four wheels equipped with pneumatic tires. The tires shall be of such a size and ply as can be maintained at tire pressures between 80 to 100 pounds per square inch for a 25,000-pound wheel load during rolling operations. The roller wheels shall be located abreast and be so designed that each wheel will carry approximately equal load in traversing uneven ground. The spacing of the wheels will be such that the distance between the nearest edges of adjacent tires will not be greater than 50 percent of the tire width of a single tire at the operating pressure for a 25,000-pound wheel load. The roller shall be provided with a body suitable for ballast loading such that the load per wheel may be varied, as directed by the Contracting Officer, from 18,000 to 25,000 pounds. The roller shall be towed at speeds not to exceed 10 miles per hour. The character and efficiency of this equipment shall be subject to approval of the Contracting Officer.

(3) Crawler-Type Tractor. - A crawler-type tractor to be used in the compaction of gravel fill, pervious fill, and processed sand fill layers as well as the compaction of random and impervious fill layers in restricted areas where it is impracticable to operate a roller, shall weigh not less than 20,000 pounds and shall exert a unit tread pressure of not less than 9 pounds per square inch.

(4) Light Weight Tractor. - A light weight tractor to be used in the compaction of impervious random and gravel fill materials placed on uneven bedrock surfaces as specified in subparagraph 5-06g(3) above, and elsewhere as directed shall be a small crawler-type tractor weighing not over 13,000 pounds and having a tread width of 13 inches or less or a small rubber-tired tractor weighing at least 4,000 pounds.

(5) Power Tampers. - Power tampers for the compaction of compacted backfill and special impervious fill shall be commercially manufactured pneumatic tampers approved by the Contracting Officer. Jack hammers and similar equipment not specifically designed and manufactured for the compaction of earth will not be approved.

(6) Surface Vibrator. - A surface vibrator for use in compacting gravel backfills shall be a commercial make of plate surface vibrator similar or equal to the Jackson Vibratory Compactor manufactured by the Electric Tamper and Equipment Company, Ludington, Michigan and approved by the Contracting Officer.

b. Compacted Impervious and Random Fills. - After a layer of impervious or random fill material has been dumped and spread, it shall be disc harrowed, if required, to break up and blend the fill material, unless disc harrowing as specified under Paragraph 5-07 of this section has been performed to obtain uniform moisture distribution. Disc harrowing shall be performed to a depth of at least 6 inches. When the moisture content and the condition of a layer is satisfactory, the lift shall be compacted by not less than 6 complete passes of the tamping roller or 4 complete passes of the rubber-tired roller except as otherwise stated herein. A complete pass shall consist of the entire coverage of the area with one trip of the equipment specified. Each trip of the tamping roller shall overlap the adjacent trip not less than two feet. In no case shall rollers be operated within zones of compacted backfill. A roller shall be operated to overlap the layers within zones of "special impervious fill" as specified in Paragraph 5-10. In areas such as ditches, depressions, excavated areas with limited widths or extents, which, in the opinion of the Contracting Officer, are too restricted for operations of a required roller to compact the fill material, the fill material shall be placed as specified in Subparagraph 5-06g(2) and each layer shall be compacted by 6 coverages of the tread of the specified crawler-type tractor after the material in the layer is satisfactorily conditioned for moisture content. Where impervious or random fill materials are to be compacted with the specified light weight tractor, each layer shall be compacted by a number of coverages of the tread or rear wheel of the specified light weight tractor equal to twice the number of inches of thickness of the layer being compacted except that the number of coverages shall not be less than 6 nor more than 20. At the outer slopes of the embankment, special care shall be taken to insure the required compaction of all impervious materials with gravel bedding materials. Dumping, spreading, moisture conditioning and compacting of a layer of fill material may be performed simultaneously, providing there is sufficient total area to permit these operations to proceed in different areas of fill. The compaction operations shall be confined, until completed, to one area adequate in size for establishing an orderly pattern of rolling. No dumping, spreading or moisture conditioning shall be performed within the area being rolled during the period of the compacting operation.

c. Special Impervious Fills. - Special impervious fill material adjacent to certain walls and bedrock surfaces shall be compacted as specified in Paragraph 5-10 of this section.

d. Compacted Pervious, Gravel and Processed Sand Fill. - After a layer of pervious, gravel or processed sand fill material has been dumped and spread and its moisture content and condition determined to be satisfactory, it shall be compacted as specified above for random or impervious fill. After each layer of gravel fill material, pervious fill material or processed sand fill material has been dumped and spread and its moisture content and condition determined to be satisfactory, it shall be compacted with 6 coverages of the tread of the specified crawler-type tractor or 4 complete passes of the specified rubber-tired roller. Where gravel fill material is to be compacted with the specified light weight tractor, each layer shall be compacted by a number of coverages of the tread or rear wheel of the tractor equal to the number of inches of thickness of the layer being compacted except that the number of coverages shall not exceed 10 nor be less than 4. Layers of gravel fill to be compacted with the light weight tractor which are over 6 inches in thickness shall be saturated during compaction.

e. Additional Rolling. - If, in the opinion of the Contracting Officer, the desired compaction of the material for any portion of compacted embankment fill is not secured by the minimum number of passes or coverages specified, additional complete passes or coverages shall be made over the surface area of such designated portion until the desired compaction has been obtained.

5-09. INITIAL FILL ON BEDROCK. - The areas of bedrock surfaces upon or adjacent to which compacted gravel, impervious or random fill materials are to be placed shall be stripped and cleaned as specified in Section 3, "EXCAVATION." The initial layers of gravel fill materials placed upon bedrock surfaces shall be as specified in Paragraphs 5-06, 5-07 and 5-08 of these specifications. During the placement of layers of random or impervious fill material, special effort shall be made to obtain compaction adjacent to and a tight contact with inclined bedrock surfaces using the rolling equipment treads of tractors or wheels of rubber-tired equipment available at the site of the work. The open joints and cracks in the areas of bedrock surface upon or adjacent to which compacted impervious or random fill material is to be placed shall be filled with mortar as and where specified in Paragraph 5-05, above. Prior to the placement of a layer of impervious or random fill material which is to be compacted by the specified rollers or by the specified crawler-type tractor upon a bedrock surface, depressions, steps, or cavities in the bedrock surface, as selected by the Contracting Officer, within the contact area, shall be filled with special impervious fill in accordance with Paragraph 5-10 below.

The initial layers of impervious and random fill material to be compacted by rolling placed upon bedrock surfaces shall be as specified in Paragraphs 5-06, 5-07 and 5-08 of these specifications.

5-10. SPECIAL IMPERVIOUS FILL. - a. Walls and Steep Bedrock Surfaces. - Special impervious fill material shall be placed adjacent to all walls within the contact areas of the surfaces of the walls and the compacted impervious fill sections and to steep bedrock surfaces at the sections shown on the drawings and at other locations as directed by the Contracting Officer. The special impervious fill material shall be placed and compacted in a manner to insure a very tight contact between the fill and the wall or bedrock surface and satisfactory compaction of the fill in the vicinity of the surface. The special impervious fill material shall be the same material and shall be placed, conditioned and compacted as specified for impervious backfill in Paragraph 5-11 of this section. The special impervious fill shall extend away from the wall or bedrock surface at least 12 inches into the area of operation of rolling equipment. The horizontal width of special fill will vary accordance to the unevenness and steepness of the wall or rock surface. The horizontal width of 2 feet shown on the drawings is for payment purposes only and does not indicate the actual widths that will be required. The special impervious fill materials shall be placed and compacted to a height equal to the thickness of each of the adjoining fill layers prior to the placement of the adjoining fill layer. After placement of the adjoining fill layer, special impervious fill material shall not be placed until after compaction by rolling is completed along the wall. During the rolling operation, the roller shall be operated as close to the wall or bedrock surface as possible, traveling parallel with the surface. In areas where practical, the fill in the vicinity of a wall and rock surface shall have a slope upward toward the wall of 1 on 4 or steeper.

b. Depressions in Bedrock Surfaces. - Depressions, steps and cavities in the bedrock surfaces, as selected by the Contracting Officer, within the bottom of the foundation cut-off, shall be filled with special impervious fill material as directed. Similar foundation areas of the compacted impervious and random fill material between the foundation cut-off of the dam and the upstream limit of the compacted pervious fill zone which have been hand cleaned in accordance with Section 3, "EXCAVATION", shall be filled with special impervious fill material to the extent considered necessary by the Contracting Officer to obtain satisfactory compaction in the initial compacted impervious or random fill layers. The use of special impervious fill material shall be limited to the amount necessary to obtain a working surface and areas which will permit the placement and compaction of initial layers of compacted impervious or random fill material as specified in Paragraph 5-09, above. The special impervious fill material shall be the same material and shall be placed, conditioned, and compacted as specified for impervious backfill in Paragraph 5-11, below. At steps in the bedrock surface, the special impervious fill will generally be placed and compacted to form a uniform slope of 4 horizontal on 1 vertical.

5-11. BACKFILLS. - a. General. - The various types of backfill materials shall be placed to the lines, grades, and cross-sections indicated on the drawings or as modified by the Contracting Officer within any other zones defined by the Contracting Officer, except as stated below. All backfill materials shall be compacted as stated herein. In excavated areas adjacent to concrete structures where the actual excavation slopes do not correspond with the payment limits shown on the drawings or as modified by the Contracting Officer, the backfill shall extend to the actual excavation slopes. Only equipment specified in this paragraph shall be used to place, spread, and compact backfill. No backfill material or other load shall be placed on or against surfaces of concrete structures, for periods of 14 days, after placing the concrete. The materials for impervious, and gravel backfills shall be as specified in Paragraph 5-04 of this section for impervious, and gravel fill materials, respectively. The preparation of foundation for backfill shall be as specified in Paragraph 5-05 of this section.

b. Compacted Impervious Backfill. - The placement and compaction of impervious backfill material shall be in a manner that will produce satisfactory compaction and a tight contact of the backfill material with the adjoining concrete or bedrock surface. No impervious backfill material shall be placed in water or on a surface of previously placed backfill which has become soft due to rain, frost or other conditions. All soft material shall either be recompacted or removed as directed. The material for compacted impervious backfill shall be conditioned to provide a moisture content at time of compaction between optimum moisture content and 3 percentage points above optimum as determined by AASHO Standard Compaction Method No. T99-57, Method A. All stones greater than 3 inches in diameter shall be removed from the material during placement. Materials to be spread shall be piled outside the limits of the backfill area. The backfill shall be constructed by spreading material in layers 2 inches or less in thickness by hand shoveling. Each layer of material shall be compacted by at least 4 coverages of the tamping foot of an approved power tamper. At least two tampers shall be in operation for every laborer spreading the material. To insure the development of a tight contact of backfill material with concrete or rock surfaces, layers of material shall be placed to form a fillet adjacent to the surfaces. Each layer of the fillet shall be compacted with approved power tampers with the direction of tamping as near to perpendicular as practical to the concrete or rock surface.

c. Compacted Gravel Backfill. - The placement and compaction of gravel backfill material shall be in a manner that will produce satisfactory compaction and complete filling immediately adjacent to bedrock and concrete surfaces. Compacted gravel backfill material shall be spread by hand shoveling in approximately horizontal layers not exceeding 4 inches in thickness and each layer shall be compacted either by 4 coverages of the tamping foot of an approved power tamper or by an

approved surface vibrator of standard commercial make. If a vibrator is used, the base of the vibrator shall be in contact with each square foot of the surface of the layer being compacted for a period of at least 20 seconds. All stones having maximum dimensions greater than 4 inches shall be removed from the layer prior to compaction by either method.

5-12. SLIDES. - In the event of slides in any part of the embankment prior to final acceptance of the work, the contractor shall remove material from the slide areas as directed and shall rebuild such portion of the embankment. In case it is determined that the slide was caused through the fault of the contractor, the removal and disposal of material and the rebuilding of the embankment shall be performed without cost to the Government, otherwise, this work will be paid for at the applicable contract unit prices for borrow excavation and compacted fill or backfill.

5-13. MEASUREMENT. - a. Compacted Fills. - The quantities of compacted impervious, random, pervious, gravel, and processed sand fills to be paid for will be the volumes computed from the applicable lines, grades, thicknesses, and limits shown on the drawings, specified herein, or as directed for the respective embankment sections. The limits of sections of the fills or materials which are not definite on the drawings or as stated in these specifications and which depend upon topography and field conditions shall be determined by field surveys. In areas where it is impracticable to place a layer of gravel fill or uniform thickness due to the unevenness of the foundation, the limits of the gravel fill layer shall be as determined by field surveys. In the embankment where the bubble gage shelter is to be constructed, the lines, grades, and limits of the sections of fill materials will be taken as being the continuations of the normal lines, grades, and limits on either side of the bubble gage shelter.

b. Backfill. - Compacted backfills at locations shown on the drawings will be measured for payment as the volumes computed from the applicable limits and payment lines indicated on the cross sections, shown on the drawings, as stated in these specifications or as otherwise established by the Contracting Officer. The measurements shall not include the volumes of compacted backfill material placed outside the excavation payment lines shown on the drawings. Backfill directed to be placed at locations not shown on the drawings will be measured as the actual volume of backfill in place.

c. Special Impervious Fill. - Special impervious fill placed against concrete walls will be measured for payment as a volume on the basis of a zone of fill 2 feet thick measured horizontally with an area equal to the actual area of contact of the fill against the wall. Special impervious fill at locations shown on the drawings against steep bedrock surfaces will be measured for payment as a volume on the basis of a zone

2 feet thick with an area equal to the projection horizontally upon a vertical plane of the surface area against which special impervious fill has been satisfactorily placed. The plane on which the projection is made will be parallel to the centerline of the conduit for measurement of special impervious fill placed against the side rock excavation slopes. Special impervious fill directed to be placed against steep bedrock faces at locations other than shown on the drawings will be measured as the actual volume in place. Special impervious fill which is placed in depressions, steps and cavities in bedrock surfaces shall be measured for payment as the total volume in place as determined by field surveys made of the foundation areas of the depressions, steps and cavities prior to filling and surveys made of the finished surfaces after filling.

d. Mortar for Foundation Preparation. - Mortar for filling cracks and joints in areas to receive compacted impervious and random fills will not be measured for separate payment.

e. Additional Rolling. - Additional rolling for compaction will be measured for payment on the basis of the number of roller hours the compaction equipment is operated in accomplishing the compaction specified in Paragraph 5-08 of this section.

5-14. PAYMENT. - a. Compacted Fill. - Compacted fills and materials, measured as stated in Subparagraph 5-13a. above, satisfactorily placed and compacted, will be paid for at the applicable contract unit prices per cubic yard for Item No. 12, "Compacted Impervious Fill", Item No. 14, "Compacted Random Fill;" Item No. 15, "Compacted Pervious Fill;" Item No. 16, "Compacted Gravel Fill"; and Item No. 18, "Compacted Processed Sand Fill". Such payments shall constitute full compensation for all work in connection with the preparation of the foundations of the embankments (other than that specified in Subparagraph d. below), the spreading, harrowing, conditioning for moisture, compacting, removal of objectionable material, and all other incidental work required for the construction, protection, and maintenance of embankment sections exclusive of compensation for the excavation and transportation of material from required excavations and from the borrow area. Payment of contract unit prices for "Compacted Gravel Fill", "Compacted Pervious Fill" and "Compacted Processed Sand Fill" shall, in addition, include all costs of furnishing acceptable material and transporting it to the locations in which it is to be placed.

b. Backfills. - Compacted backfills measured as stated in Subparagraph 5-13b. above, will be paid for at the applicable contract unit prices for Item No. 13, "Compacted Impervious Backfill"; and Item No. 17, "Compacted Gravel Backfill". Such payments shall constitute full compensation for all work in preparation of the foundation of contact surfaces (other than that specified in Subparagraph d. below) and the spreading, conditioning, and compacting of backfill material and all other

operations incidental to the placement of backfill materials. The payment of contract unit price for Item No. 17, "Compacted Gravel Backfill" shall also include compensation for furnishing acceptable gravel backfill material and transporting it to the locations in which it is to be used.

c. Special Impervious Fill. - Special impervious fill will be paid for at the applicable contract unit price per cubic yard for Item No. 13, "Compacted Impervious Backfill". Such payment shall constitute full compensation for the preparation of foundations or contacting surfaces (other than that specified in Subparagraph d. below) and the spreading, conditioning, compacting and all other operations incidental to the placement of the special impervious fill material.

d. Mortar for Foundation Preparation. - Mortar for filling cracks and joints in bedrock foundation areas will be included in and be subsidiary to the contract unit price for Item 11, "Hand Cleaned Bedrock Surfaces".

e. Additional Rolling for Compaction. - Additional rolling for the compaction of fill materials will be paid for at the applicable contract unit price per equipment hour for Item No. 19, "Additional Rolling of Fill". Such payment shall constitute full compensation for all costs including hauling unit or prime mover, and shall be based on the number of hours the roller is in actual operation with no allowances for down or standby time.

SECTION 6

ROCK FILL, ROCK SLOPE PROTECTION, GRAVEL BEDDING, AND ROAD GRAVEL (Items 20 to 23, Incl)

INDEX

SECTION 6

ROCK FILL, ROCK SLOPE PROTECTION, GRAVEL BEDDING, AND ROAD GRAVEL
(Items 20 to 23, Incl.)

6-01. SCOPE. - The work covered in this section of the specifications consists of furnishing all plant, labor, and materials, and performing all operations in connection with the construction of all sections and layers of rock fill, rock slope protection, gravel bedding, and road gravel in the embankment and other project features in strict accordance with these specifications and the applicable drawings subject to the terms and conditions of the contract.

6-02. MATERIALS. - a. General. - All gravel bedding and road gravel materials shall be furnished by the contractor from approved sources. All provisions of Section 5, EMBANKMENT, relative to contractor furnished materials shall be applicable to the gravel bedding and road gravel materials except as specified otherwise herein. The loading and hauling of any of the materials covered by this section of the specifications shall be performed in a manner which will prevent segregation and will assure placement of well-graded materials. Rock fill and rock slope protection materials shall be stockpiled to the extent necessary in accordance with the provisions of Section 3, EXCAVATION.

b. Rock Fill. - Rock fill material shall consist of hard, durable and sound stone or rock fragments obtained from rock excavations required for the construction of project features and of oversize stones removed during placement of fill materials in the embankment. Rock fill materials shall not contain earth, rock fines, roots and debris in quantities considered objectionable by the Contracting Officer. Prior to excavation to obtain rock fill material, the bedrock surface shall be machine cleaned as specified in Section 3, EXCAVATION. Rock excavation, blasting, and stockpiling shall be in accordance with the provisions of Section 3, EXCAVATION to obtain the most suitable material possible from the required rock excavations. All loose earth shall be removed from rock fill material composed of oversize stones prior to placement in the rock fill sections. Rock fill material from required rock excavations shall be quarry-run type material produced in accordance with the provisions of Section 3, EXCAVATION to meet grading and size requirements. Except as stated in Paragraph 6-04, rock fill material shall be a well-graded mixture of rock fragments or stones. The maximum size stone or rock fragments shall not have maximum dimensions greater than two thirds (2/3) the thickness of the layer being placed or have a volume greater than 1/2 cubic yard. Larger size rock fragments may be placed in certain portions of rock fill sections as stated in Paragraph 6-04.

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c. Rock Slope Protection. - All requirements in subparagraph b. above, for rock fill material shall be applicable for rock slope protection material except as otherwise stated herein. If necessary to obtain the required quantity of rock slope protection material, rock blocks from required rock excavation which are oversize for placement in the rock slope protection layers shall be broken to conform to gradation requirements.

d. Gravel Bedding. - Gravel bedding material shall consist of reasonably-well graded bank run sandy gravel or gravelly sand furnished by and at the expense of the contractor from approved sources. Gravel bedding material shall conform to the following gradation requirements:

(1) The material shall contain no individual stone with a maximum dimension greater than 12 inches nor greater than one-half the thickness of the gravel bedding layer to be placed. Material shall not contain more than 50 percent, by dry weight, of stones larger than 3 inches in maximum dimension.

(2) Of the component of the material passing the 3-inch U.S. Standard Sieve, at least 25 percent and no more than 60 percent, by dry weight, of the particles shall pass the No. 4 U.S. Standard Sieve.

(3) Of the component of the material passing the No. 4 U.S. Standard Sieve, not more than 15 percent, by dry weight, of the particles shall pass the No. 200 U.S. Standard Sieve.

e. Road Gravel. - Material for road gravel shall consist of natural bank-run, well-graded, sandy gravel or gravelly sand furnished by and at the expense of the contractor from approved sources and meeting the following gradation requirements:

U.S. Standard Sieve Size	Percent Passing by Dry Weight
3-inch	100
No. 4	30-60
No. 200	2-10

f. Sources Investigated. - Several off-site deposits of gravels have been investigated to determine the suitability and availability of materials for gravel bedding and road gravel. These deposits and the investigations are discussed in Section 5, EMBANKMENT.

6-03. FOUNDATION PREPARATION. - a. Embankment Foundation Areas. - The foundation areas of the embankment upon which rock fill, rock slope protection and gravel bedding are to be placed shall be stripped and prepared as specified in Section 3, EXCAVATION. No material shall be placed in any foundation area until the area has been inspected and approved by the Contracting Officer.

b. Surface Base Areas. - The surface areas of embankment sections of impervious fill, gravel bedding, and areas produced by excavations outside of the limits of the foundations of the embankments all upon which gravel bedding, rock fill or rock slope protection materials are to be placed shall be trimmed to conform to the lines and grades shown on the drawings, except as otherwise stated herein. The surface areas of impervious fill sections may have a tolerance of 4 inches in limited portions from the lines and grades shown on the drawings. Where surface base areas of natural earth or embankment sections of impervious fills are below the lines and grades shown on the drawings, the low areas shall be brought to grade either by (1) filling with earth similar to the base material and placed and compacted, as directed, with pneumatic tampers or crawler-type tractors, or (2) by filling with the material to be placed on the area, and no additional payment will be made for any material or work thus required. Immediately before the placing of any material, the prepared base shall be inspected and no material shall be placed thereon until the areas have been approved.

c. Subgrade for Roads. - The entire subgrade surface, prior to placing road gravel, shall be compacted by 6 coverages of the tread of a crawler type tractor. After compaction, the surface of the subgrade shall show no deviation in excess of 2 inches from the grades indicated on the drawings. No road gravel shall be placed in any subgrade area until the area has been inspected and approved by the Contracting Officer.

6-04. ROCK FILL. - a. General. - Rock fill material, as specified in Paragraph 6-02 of this section, shall be used to construct the rock fill sections of the embankment. No rock fill material shall be placed against concrete structures until the concrete has been in place at least 14 days. In placing rock against concrete structures, care shall be taken to protect concrete.

b. Placement. - Rock fill material shall be placed in such a manner as to produce a mass of rock with the minimum practical percentage of voids. The rock fill sections shall be constructed to the lines and grades shown on the drawings. Except for the horizontal surface of the upstream berm, a tolerance of plus or minus 6 inches from the slope lines and grades shown on the drawings will be allowed in the finished surface of the rock fill, except that either extreme of such tolerance shall not be continuous over an area greater than 200 square feet. Placement shall be in a manner which will not cause segregation of the particles and which will avoid displacement of gravel bedding materials. Placement by dumping into chutes, pushing by bulldozers, or by other methods likely to cause segregation, will not be permitted. The larger rock fragments shall be well distributed in the entire mass and the finished rock fill sections shall be free from segregation,

objectionable pockets of small stones, and clusters of larger rock fragments. Oversize stones obtained from embankment fill materials shall be embedded in other rock fill material. Rock fill shall be graded and worked with draglines, backhoes, or similar equipment to the extent necessary to produce outer exposed surfaces within the specified tolerances and having uniform coarse textured appearances. The exposed sloped surfaces shall consist mainly of medium sized rock fragments, each weighing more than 15 pounds, which shall not be embedded in fine material. All voids in the surface of the rock fill within the limits of the 12 foot berm shall be filled with rock spalls or selected rock fill of such gradation as to result in a surface suitable for the operation of a pickup truck. Rearranging of individual stones by hand or by mechanical equipment will be required to the extent necessary to obtain good distribution of stone sizes and to shape the surface within the specified tolerances. Portions of rock fill sections with horizontal widths greater than 10 feet shall be constructed in horizontal lifts of 3 feet thickness. Elsewhere, rock fill material shall be placed to its full course thickness in one operation wherever practicable. A bulldozer may be used to level the surfaces of the horizontal lifts, but no bulldozer or similar equipment will be permitted to operate on the outer surfaces of rock fill sections. Rock fragments and stones greater than specified in Paragraph 6-02 may be used in the inner portions of the horizontal lifts provided that they are embedded in the specified rock fill material. The maximum size rock or stone shall be that which can be placed in a layer 3 feet thick. This larger size material shall not be placed within 3 feet of the surfaces of the adjacent gravel bedding layers or of the outer surfaces of the rock fill sections. The placement of rock fill materials in horizontal lifts shall be performed in such a manner as to avoid a layered appearance in the outer surface. During the construction of the upstream rock fill section, in the vicinity of the conduit, provision shall be made for the later installation of the bubble gage conduit and air vent. A trench shall be left open at the surface of the rock fill for the installation of the bubble gage conduit and air vent. Rock fill material shall be placed along the trench in such a manner that the rock fill may be placed in the trench after the bubble gage conduit and air vent have been placed.

c. Measurement. - The quantity of rock fill to be paid for will be measured as the total volume computed from the lines, grades, and limits of the rock fill sections shown on the drawings or as modified by the Contracting Officer excluding the rock fill for service road. The lower limits of rock fill sections which are not definite on the drawings and depend upon field conditions and topography will be determined by a survey made immediately prior to placement of the rock fill material.

d. Payment. - Payment for rock fill will be made at the contract unit price per cubic yard for Item 22, "Rock Fill". Such payment shall

constitute full compensation for handling, cleaning, sorting, and placing of rock fill material including shaping, grading, working the surface of rock fill sections, filling of voids in the rock fill surface within the limits of the berm, and all other work incidental to the construction of the rock fill sections, exclusive of excavation, stockpiling, rehandling from stockpiles, hauling, removal of stones, and other work for which payment will be made in accordance with Section 3, "EXCAVATION" and Section 5, "EMBANKMENT". Payment for the placement of rock fill material in the trench for the bubble gage conduit and air vent and the finishing of the rock fill surface in the trench area shall be included in the applicable contract lump sum prices for "Bubble Gage Shelter" and "Air Vent". Payment for providing rock fill for service road is included under Item 44, "Service Road".

6-05. ROCK SLOPE PROTECTION. - a. Placement. - Rock slope protection material, as specified in Paragraph 6-02 of this section, shall be placed to the lines, grades, thicknesses, and limits shown on the drawings or as otherwise directed by the Contracting Officer to form the rock slope protection layers. All provisions in Paragraph 6-04 relative to the placement of rock fill material in the embankment shall be applicable for constructing the rock slope protection layers except that only material specified in Subparagraph 6-02c shall be used. Rock slope protection material shall be placed to the required thickness in a single course. Placement of rock slope protection material shall not lag behind by more than 3 feet measured vertically nor precede the placement of adjacent gravel bedding materials. Rock block posts shall be located where shown.

b. Measurement. - The quantity of rock slope protection to be paid for will be measured as the total volume computed from the lines, grades, thicknesses, and limits shown on the drawing or as modified by the Contracting Officer. The lower limits of the rock slope protection layers which are not definite on the drawings and depend upon field conditions and topography will be determined by a survey made immediately prior to placement of rock slope protection material. Each rock block post for measurement purposes will be considered as 8 cubic feet of rock slope protection.

c. Payment. - Payment for rock slope protection including rock block posts will be made at the contract unit price per cubic yard for Item 23, "Rock Slope Protection". Such payment shall constitute full compensation for handling, cleaning, sorting, and placing of rock slope protection material, the shaping, grading, and working the outer surfaces, the breaking of oversize rock blocks, and all other work incidental to the construction of rock slope protection layers, exclusive of excavation, stockpiling, rehandling from stockpiles, hauling, removal of stones, and all other work for which payment is made in accordance with Section 3, "EXCAVATION" and Section 5, "EMBANKMENT". Payment for the placement of rock slope protection material in the trench for the bubble gage

conduit, air vent and the finishing of the rock slope protection surface in the trench area shall be included in the contract unit price for Item 36, "Bubble Gage Shelter".

6-06. GRAVEL BEDDING. - a. General. - Gravel bedding material as specified in Paragraph 6-02 of this section shall be placed to the lines, grades, thicknesses and limits shown on the drawings or as directed by the Contracting Officer to form the gravel bedding layers.

b. Placement. - Gravel bedding material shall be placed and spread uniformly on the prepared base, in a satisfactory manner, to provide a layer with the thickness shown on the drawings or as directed. Placing of material by methods which will tend to segregate particle sizes within the layer will not be permitted. Any damage to the surface of the gravel bedding prior and during placing of the rock fill and rock slope protection materials shall be repaired before proceeding with the work. Compaction of the gravel bedding will not be required but it shall be finished to present a reasonably even surface free from mounds or windrows. Except in the vicinity of the bubble gage shelter placement of gravel bedding on slopes of embankment sections of impervious fill shall not lag behind the placement of adjacent embankment fill material by more than 5 feet measured vertically. During the placement of the gravel bedding on the upstream slope of the embankment in the vicinity of the conduit, provisions shall be made for the later installation of the bubble gage conduit and air vent. In no case shall the gravel bedding, that is to be placed after the installation of the bubble gage conduit and air vent, be stockpiled on completed portions of rock fill or rock slope protection.

c. Measurement. - The quantities of gravel bedding to be paid for will be measured as the volumes computed from the respective lines, grades, thicknesses, and limits shown on the drawings or as directed by the Contracting Officer excluding gravel bedding for Service Road. The lower limits of the gravel bedding which are not definite on the drawings and which depend upon field conditions and topography shall be determined by surveys.

d. Payment. - Payment for gravel bedding will be made at the contract unit price per cubic yard for Item No. 20, "Gravel Bedding". Such payment shall constitute full compensation for furnishing, hauling, placing of gravel bedding, maintenance of the layers, preparation of foundations, and all other work incidental to the construction of the gravel bedding as specified. Payment for providing gravel bedding for Service Road is included under Item 44. No payment will be made for excess thicknesses of gravel bedding layers nor for material required to replace foundation material lost by rain wash, wind erosion, or otherwise, except for additional gravel bedding material ordered in writing by the Contracting Officer. Payment for the placement of gravel bedding in the trench area for the bubble gage conduit and air vent shall be included in the contract lump sum price for "Bubble Gage Shelter".

6-07. ROAD GRAVEL. - a. General. - Road gravel material as specified in Paragraph 6-02 above, shall be placed to the thickness and limits indicated on the drawings or as directed by the Contracting Officer to form the road gravel section of the road across the top of the embankment and the base course for the parking area.

b. Placement. - After the subgrade is prepared in accordance with the provisions in Paragraph 6-03 above, the road gravel section shall be constructed by spreading the material in layers not exceeding 6 inches in thickness. The material as spread shall be well graded with no pockets of fine material nor segregation of coarse and fine particles. After spreading, each layer shall be compacted with at least 6 coverages of the tread of a crawler type tractor weighing at least 20,000 pounds. The final surface of the road gravel shall be graded to provide a smooth even surface. The contractor shall maintain the final surface in a satisfactory condition until final completion and acceptance of all work under the contract.

c. Measurement. - The quantity of road gravel excluding road gravel for Service Road to be paid for will be measured as the volume computed from the thicknesses and limits indicated on the drawings or as modified by the Contracting Officer.

d. Payment. - Road gravel will be paid for at the contract unit price per cubic yard for Item No. 21, "Road Gravel". Such payment shall constitute full compensation for furnishing, hauling, placement, compaction, grading, and all other work incidental to the construction and maintenance of road gravel layers as specified. Payment for providing road gravel for Service Road is included under Item 44.

SECTION 7

FOUNDATION DRILLING AND GROUTING
(Item 24)
(Index)

SECTION 7

FOUNDATION DRILLING AND GROUTING
(Item 24)

7-01. GENERAL. - a. Scope. - This section of the specifications covers drilling exploratory holes; drilling drain holes; drilling, washing and pressure testing grout holes; making grout connections; furnishing, handling, transporting, storing, mixing and injecting the grouting materials; patching the finished grout holes; care and disposal of drill cuttings, waste water and waste grout; clean-up of the areas upon completion of the work and all such other operations as are incidental to the drilling and the grouting.

b. Program. - The work contemplated consists of constructing a grout curtain beneath the dam and spillway weir the approximate locations, limits, and details of which are indicated on the contract drawings. Except at the outlet conduit the grouting at any required location shall be initiated immediately following clean-up and foundation preparation to design grades as approved by the Contracting Officer, and shall be completed prior to placement of concrete for structures. At the outlet conduit the grouting shall be done after completion of the concrete conduit in the section extending 50 feet both upstream and downstream of the centerline of the grout curtain and after removal of forms and thorough clean-up of the rock surface in the conduit excavation. In no case will grouting be allowed closer than 50 feet to an area in which rock excavation or overburden excavation has not been completed to grade to facilitate observation and caulking of grout leaks. When rock excavation is to be made within 100 feet of a completed grout curtain, all precautions will be exercised in excavating the rock to avoid damage to the previously grouted area. The program shown on the drawings and described herein is tentative and is presented for the purpose of canvassing bids. The amount of drilling and grouting which actually will be required is unknown, and will be governed by conditions encountered as the work progresses.

c. Procedures. - Grouting mixes, pressures, the pumping rate and the sequence in which the holes are drilled and grouted will be determined in the field and shall be as directed.

7-02. EQUIPMENT. - a. General. - All drilling and grouting equipment used shall be of a type, capacity and mechanical condition suitable for doing the work, as determined by the Contracting Officer. The power and equipment and the layout thereof shall meet all applicable requirements of local, State, and Federal regulations and codes, both safety and otherwise.

b. Drilling Equipment. - Standard drilling equipment of the rotary, water circulating, diamond core drilling type shall be used to perform the drilling as specified in paragraphs 7-04c through 7-04e.

c. Grouting Equipment. - The grout plant shall be capable of supplying, mixing, stirring and pumping the grout, to the satisfaction of the Contracting Officer. The plant shall have a minimum capacity of 40 g.p.m. of grout injected at a pressure not greater than 65 p.s.i. It shall be maintained in first-class operating condition at all times and any grout hole that is lost or damaged due to mechanical failure of equipment or inadequacy of grout supply shall be replaced by another hole, drilled by the contractor at his expense.

7-03. GROUTING MATERIALS. - a. Composition. - Grout will be composed of water and cement except when mortar grout may be required as specified in Paragraph 7-05f (1) and (2). The grout mixes will be designed by the Contracting Officer and will be varied to meet the characteristics of each hole as determined by conditions encountered. The various materials to be furnished by the contractor shall conform to the specifications listed in subparagraphs b, c, and d, below.

b. Water. - The water used in the grout shall conform to Paragraph 9-07.

c. Cement. - Cement in grout shall conform to Paragraph 9-04. The use of bulk cement will be permitted provided the contractor employs methods of handling, transporting, and storage that are satisfactory to the Contracting Officer, otherwise, only cement furnished in cloth or paper bags will be accepted to use in the work. A sufficient quantity of cement shall be stored at or near the site of the work to insure that grouting operations will not be delayed by shortage of cement. In the event the cement is found to contain lumps or foreign matter of a nature and in amounts which, in the opinion of the Contracting Officer, may be deleterious to the grouting operations, screening through a standard 100 mesh screen may be required. No payment will be made for such screening.

d. Sand. - Sand for grout shall consist of hard, tough, durable, uncoated particles. It may be composed of natural sand, manufactured sand or a combination of natural and manufactured sand. The shape of the particles shall be generally rounded or cubical and shall not contain more than 15 percent of flat or elongated pieces having a maximum dimension in excess of five times the minimum dimension. If the sand is a combination of separately processed sizes or classification, or a combination of natural and manufactured sands, the different components shall be batched separately or, subject to written approval, blended prior to delivery to the mixing plant. The sand shall be well graded from fine to coarse and the gradation, as determined in accordance with ASTM designation C136-61T, "Method of Test for Sieve or Screen Analysis of Fine and Coarse Aggregates" (Tentative) shall conform to the following requirements:

Sieve Designation (U. S. Std. Square Mesh)	Cumulative Passing	Percentage by Weight Retained
8	100	0
16	95-100	0-5
30	60-85	15-40
50	20-50	50-80
100	10-30	70-90
200	0-5	95-100

In addition to the grading limits shown above, all sand used in the work shall have a fineness modulus within the range of 1.50 to 2.00. The grading of the sand as delivered to the mixer, during any 24-hour period of operation, shall be controlled so that the fineness moduli of samples taken will not vary more than 0.10 ± from the average fineness modulus. The results of previous tests and the service record may be used to determine the acceptability of the sand. In the event previous tests and a service record are meager or not available, as in the case of newly operated sources, or are not satisfactory, the sand shall be subjected to such tests as are necessary to determine its acceptability. All sampling of sand shall be in accordance with the applicable sampling provisions contained in Fed. Spec. SS-R-406c(1) (Part 2) for "Road and Paving Materials; Methods of Sampling and Testing," or as directed. Unless otherwise directed, all test samples shall be taken under the supervision of the Contracting Officer and shall be delivered to a designated point, at the expense of the contractor, at least 60 days in advance of the time when sand will be required at the site of work. All tests will be made by the Government at its expense. The tests to which the sand will be subjected will include specific gravity, absorption, soundness in magnesium sulphate, petrographic analyses, and any other tests that are necessary to demonstrate that mortar of adequate durability can be produced. The percentage of surface moisture in terms of the saturated surface-dried sand will be determined in accordance with ASTM C70-47 for "Standard Method of Test for Surface Moisture in Fine Aggregate," or other method giving comparable results. Sand shall be stored in such a manner as to avoid the inclusion of any foreign materials in the grout. The storage piles shall be constructed so as to prevent segregation. All sand shall remain in free draining storage for at least 72 hours prior to use.

7-04. GROUT, DRAINAGE AND EXPLORATORY HOLES. - a. General. - All holes for grouting, drainage or exploration shall be drilled at the locations, in the direction and to the depths shown on the drawings or as directed by the Contracting Officer. The first series of holes to be drilled and grouted shall be at intervals shown on the drawings and hereinafter are referred to as primary holes. The location of secondary and succeeding series (intermediate) holes shall be determined by the split spacing method as defined in subparagraph 7-05a(4). The number

of grout holes shall be increased, progressively, by the split spacing method as deemed necessary by the Contracting Officer until the amount of grout used indicates that the foundation is tight. The use of grease, "rod dope" or other lubricant on rotary drill rods will not be permitted. Each hole drilled shall be protected from becoming clogged or obstructed by means of a cap or other suitable device on the collar and any hole that becomes clogged or obstructed before completion of operations shall be cleaned out in a manner satisfactory to the Contracting Officer or another hole provided by and at the expense of the contractor. That portion of drain holes which penetrates concrete shall be formed by embedding cement-asbestos pipes in the concrete at the time of its placement, and no payment will be made for such partial depth of holes. Cost of furnishing and placing pipe shall be a subsidiary obligation included under the applicable contract prices for drilling the holes.

b. Pipe for Foundation Grouting. - All metal pipe and fittings required for constructing grout and exploratory holes shall be furnished, cut, threaded, fabricated and installed by the contractor. The pipe shall conform to Federal Specification WW-P-406a for "Pipe; Steel, (Seamless and Welded (for Ordinary Use))" Weight A, Class 1. The fittings shall be malleable iron, Type I, in accordance with Federal Specification WW-P-521d(1) for "Pipe Fittings, Malleable Iron, Wrought Iron and Steel (screwed) 150-pound." Pipe will be black steel of the diameter and in the locations indicated on the drawings. The pipe and fittings shall be cleaned thoroughly of all dirt, grease, oil, grout and mortar before installation. All joints shall be made up snug and the assembly held firmly in position and protected from damage or displacement until grouting is completed. The contractor shall take all necessary precautions to prevent any pipe from becoming clogged or obstructed from any cause and any pipe which becomes clogged shall be cleaned out in a manner satisfactory to the Contracting Officer at the contractor's expense. No separate payment will be made for this pipe and fittings as it will be considered a subsidiary obligation included under the applicable contract price for drilling the holes.

c. Pipe for Foundation Drains. - Asbestos cement pipe required for constructing drainage holes shall be furnished, cut, and embedded by the contractor. The pipe shall conform to Federal Specification SS-P-351a, "Pipe Cement Asbestos", class 150. Pipe will be of the diameter and in the location indicated on the drawings. The pipe and fittings shall be cleaned thoroughly of all dirt, grease, oil, grout and mortar immediately before embedment, and shall be held firmly in position and protected from damage or displacement while the concrete is being placed. The contractor shall take all necessary precautions to prevent any pipe from becoming clogged or obstructed from any cause and any pipe which becomes clogged shall be cleaned out in a manner satisfactory to the Contracting Officer at the contractor's expense. The presence of tramp metal such as nails, wire, bolts, nuts and other

foreign material in the pipes through which diamond drilled holes are to be drilled shall be considered as obstructions.

d. Grout Hole Drilling. - Grout holes shall be drilled with standard rotary water circulating, diamond core drilling equipment. No core recovery will be required and the type of diamond bit used shall be optional with the contractor. The minimum diameter of hole shall be 1-1/2 inches at the point of maximum penetration. Grout holes will be drilled at angles and to depths as indicated on the drawings unless otherwise specified or changed by the Contracting Officer due to conditions in the field determined after the rock is exposed by construction operations. It is not anticipated that holes in excess of 50 feet will be required. If, as the work progresses, it is determined that holes to depths greater than indicated on the drawings are necessary, drilling to such greater depth will be ordered in writing by the Contracting Officer, and the drilling to depths in excess of 50 feet will be paid for at a negotiated unit price. Drilling will be done in accordance with the "Stage Grouting, Split Spacing" method hereinafter described. Whenever the drill water is lost, or artesian flow is encountered, the drilling operations shall be stopped and the hole grouted before drilling operations are resumed in such hole. The grout so injected remaining in a partially completed hole shall be removed therefrom by washing or other methods before it has set sufficiently to require redrilling. Redrilling required because of the contractor's failure to clean out a hole before the grout has set shall be performed at the contractor's expense except that where the grout has been allowed to set by direction of the Contracting Officer, the redrilling will be paid for at the rate of 50 percent of the schedule price for drilling the grout hole.

e. Drain Hole Drilling. - Drainage holes shall be drilled into the foundation through pipes embedded in the concrete for this purpose. Drain holes shall be drilled with standard rotary, water circulating, diamond core drilling equipment, but no core recovery will be required and the contractor may use coring or noncoring bits as he may elect. The minimum diameter of hole shall be 3 inches measured at the point of maximum penetration. Drain holes will be drilled at angles and to depths as indicated on the drawings unless otherwise specified or changed by the Contracting Officer due to conditions in the field determined after the rock is exposed by construction operations. If, as the work progresses, it is determined that holes to depths greater than indicated are necessary, drilling to such greater depth will be ordered in writing by the Contracting Officer and the drilling to depths in excess of 25 feet for the 3-inch drain holes will be paid for at negotiated prices. All drain holes will be thoroughly washed after completion of drilling to remove all drill cuttings and slurry by applying water and air to the bottom of the hole and returning the wash water through the hole to the surface. Drainage holes shall not be drilled without the written approval of the Contracting Officer in any location until all adjacent grout holes within a minimum distance of 150 feet have been drilled and grouted to full depth.

f. Exploratory Hole Drilling. - The contractor shall perform such exploratory drilling as may be required to determine the condition of the rock prior to grouting or the effectiveness of the grouting operations after grouting. Exploratory drilling may also be required in areas of rock excavation of structure foundations where other drilling or grouting is not planned. All exploratory drilling shall be performed with rotary water circulating, diamond core drilling equipment using coring type bits. Since the maximum recovery of unpredictable soft or friable materials is of prime importance, the contractor shall use a standard ball bearing, swivel type, double tube core barrel equipped with diamond set core bits and standard core lifters, similar in construction and equal in performance to the Sprague and Henwood "M" series. The amount of, and the requirement for, exploratory drilling will be as directed by the Contracting Officer and no change will be made in the contract price for "Exploratory Drilling NX Holes" by reason of any amount or none of this work being required. The NX holes may be required to be drilled to varying depths, with a maximum depth of 100 feet. Special care shall be exercised to obtain cores in as good condition as possible from all holes capable of producing satisfactory cores. The contractor shall keep, in a manner satisfactory to the Contracting Officer, and furnish to the Contracting Officer an accurate Driller's Log of all exploratory holes drilled. The log shall include a non-technical description of all materials encountered in the drilling, their location in the holes and the location of special features such as seams, open cracks, soft or broked rock, points where abnormal loss or gain of drill water occurred, and any other items of interest in connection with the purpose for which the exploratory drilling is required. Wooden core boxes will be furnished by the contractor, and the contractor shall place the cores in the boxes in the correct sequence and separated accurately by wooden blocks, according to the measured distances in the holes. No box shall contain cores from more than one hole. The covers shall be fastened securely to the core boxes and the boxes shall be delivered in the vicinity of the work as directed by the Contracting Officer. Exploratory holes may be grouted under pressure, if conditions so indicate, but in all such cases the holes will be grouted to full depth in one operation and the contractor will not be required to remove the grout from any part of the hole.

7-05. DEFINITIONS AND PROCEDURES FOR DRILLING AND GROUTING. - a. General. - The drilling and the grouting shall be done by zones, using the split spacing, stage grouting method as described herein.

(1) Zone. - A zone is a predetermined partial depth of curtain. The first zone extends 15 feet downward from the rock surface. The second zone extends downward from the bottom of the first zone to the full depth of any hole. It is anticipated that hole spacing will average 10 feet in the first zone and 10 feet in the second zone for the grout curtain under the dam and 5 feet in both zones at the spillway weir.

However, these spacings will be varied in accordance with conditions encountered and as directed by the Contracting Officer. In general, all grouting in a given zone and section will be finished before work is started in the next underlying zone.

(2) Section. - A section is a reach along the grout curtain, not more than 50 feet in length in which grouting operations will not be permitted at the same time that drilling is in progress. Insofar as practicable the grout curtain will be subdivided into sections in a manner which will facilitate the contractor's operations.

(3) Stage. - A stage is a partial or complete depth of hole within any given zone. The actual depth of a stage depends upon geologic conditions encountered in drilling. It may vary from a fraction to the full depth of the zone, and is marked by the loss or gain of drill water in appreciable amounts.

(4) Split Spacing. - Split spacing is the procedure of locating an additional grout hole midway between two previcusly drilled and grouted holes.

b. Stage Grouting. - Stage grouting is a complete cycle of drilling, washing, and grouting of any portion of a hole within a given zone. It involves the placement of a grout curtain by drilling and grouting in successive operations in accordance with the following general procedure:

(1) Primary holes for foundation grouting shall be drilled to comparatively shallow depths within the first zone. The depths will be governed by the foundation conditions.

(2) The holes thus drilled shall be washed and pressure tested, and then grouted, except that when pressure testing indicates a relatively tight hole, the Contracting Officer may direct that the grouting of that hole be omitted for that stage and the hole be left open for drilling and grouting of the next stage.

(3) After grouting of any hole, the grout within the hole shall be removed by washing or by other methods before it has set sufficiently to require redrilling.

(4) After the interval of time as specified in paragraph 7-05d(2), the primary holes not already drilled to the limit of the first zone shall be drilled as directed to additional depths not exceeding the zone limit.

(5) The primary holes thus deepened shall again be washed and pressure tested and then grouted at higher pressures as directed.

(6) Again, the grout within the hole shall be removed as described above.

(7) The process of successively drilling primary holes to additional depths and grouting at higher and higher pressures in stages, as directed, shall be repeated until all of the first set of holes on the maximum spacing (see paragraph 7-04a) have been completely drilled and grouted to the depth of the first zone over such section of the grout curtain as may be directed by the Contracting Officer.

(8) After the primary holes in the first zone have been completed in any section as specified above, the second and succeeding series of holes, as determined by the "split spacing method", shall be drilled and grouted to the depth of the first zone in like manner until the first zone of that section is completely grouted as directed.

(9) The process of successively drilling to additional depths and grouting at higher and higher pressures in stages for the first series of holes and then for succeeding series of holes shall be repeated for the second and subsequent zones of the section. Other sections along the grout curtain shall be grouted in like manner until grouting of the foundation is completed to the satisfaction of the Contracting Officer. As the drilling and grouting work progresses, it may develop that conditions are such that all or parts of the foundation already grouted require additional grouting. In such event, the equipment shall be returned and additional holes for grouting shall be drilled and grouted as directed by the Contracting Officer and no additional allowance above the contract prices will be made for drilling and grouting such holes or for the expense of any movement of equipment necessary to the performance of such work.

c. Washing and Pressure Testing. - Immediately before the pressure grouting of each stage of any hole is begun, the hole shall be thoroughly washed under pressure and pressure tested. All intersected rock seams and crevices containing clay or other washable materials shall be washed with water and air under pressure to remove as much of these materials as possible. If practicable, as determined by the Contracting Officer, such material shall be ejected from one or more holes by introducing water and air pressure into an adjacent hole. In no case shall such pressure exceed the maximum grouting pressure as directed. All grout holes shall be tested with clean water under continuous pressure up to the required grouting pressure as directed. All holes sufficiently tight to build up the maximum required pressure shall be washed at such pressure and the washing shall continue as long as there is any increase in the rate at which water is taken, such increase indicating that fractures are being opened by the washing operation. Open holes in which no pressure can be built up shall be washed for a period of 5 minutes, with the pump operating at full capacity, or for

such period of time as fracture-filling is being removed, as evidenced by the escape of muddy water through surface openings or other grout holes.

d. Stage Grouting Procedures. - (1) First Stage. - The contractor shall perform the first stage, or low-pressure, shallow-curtain grouting by washing and grouting holes at locations indicated on the drawings or directed, using the "split spacing" method described in paragraph 7-05a(4). Before grouting is begun in any hole of a given series in any section, at least the nearest two holes in advance of each hole in that series shall be completely drilled for the same stage and the adjacent hole completely washed to facilitate washing and flushing out of any intervening clayfilled seams, fractures, or solution channels.

(2) Second Stage. - After all first stage grouting in any section has been completed, as specified above, the contractor shall proceed, when so directed by the Contracting Officer, with second stage drilling and grouting in accordance with the procedure outlined herein but in no case shall the deepening of any hole preparatory to grouting be commenced before a minimum period of 24 hours has elapsed since completion of the previous stage-grouting at that hole; nor shall second stage grouting be conducted within a distance of approximately 100 feet of any hole in which a previous stage of grouting has been completed until the grout in such previous stage hole has set for a period of 24 hours. Grouting at subsequent stages shall conform to the same requirements as to minimum time and distance.

e. Grouting Pressures. - Grouting pressures to be used in the work will vary with conditions encountered in the respective holes and pressures used shall be as directed by the Contracting Officer. In general, an increase in pressure proportionate to the depth of the hole applied from the top of the hole will be required. Under any conditions, the maximum grouting pressure in any part of the work shall be limited to that which, as determined by the Contracting Officer, will not lift or otherwise move any part of the foundation or adjacent structures. In no event will pressures in excess of 65 p.s.i. be required.

f. Grouting. - All pressure grouting operations shall be performed in the presence of the Contracting Officer, and shall be in accordance with the following general procedures.

(1) Grout Mixes. - Mixes shall be in the proportions directed by the Contracting Officer who will, from time to time, direct changes to suit the conditions found to exist in the particular grout hole. The water-cement ratio by volume will be varied to meet the characteristics of each hole as revealed by the grouting operation and will range between 3.0 and 0.6; the greater part of the grout probably being placed at a ratio of about 1.0. The types of grout shall be as follows:

(a) Neat cement grout shall consist of cement and water.

(b) Mortar grout shall consist of cement, sand, and water.

(2) Grout Injection. - In general, if pressure tests indicate a tight hole, grouting shall be started with a thin mix. If an open hole condition exists, as determined by loss of drill water or inability to build up pressure during washing operations, then grouting shall be started with a thicker mix and with a grout pump operating as nearly as practicable at constant speed at all times; the ratio will be decreased, if necessary, until the required pressure has been reached. If this procedure does not produce the desired pressure, mortar grout shall be used and the mix varied as necessary to produce the desired results. When the pressure tends to rise too high, the water-cement ratio shall be increased and/or the mix of mortar grout changed or discontinued as may be required to produce the desired results. If necessary to relieve premature stoppage, periodic applications of water under pressure shall be made. Under no conditions shall the pressure or rate of pumping be increased suddenly as either may produce a water-hammer effect which may promote stoppage. The grouting of any hole shall not be considered complete until that hole refuses to take any grout whatever at three-fourths of the maximum pressure required for that stage. Should grout leaks develop, the contractor shall calk such leaks when and as directed, the cost thereof being included in the contract price for Item "Placing Grout".

If, due to size and continuity of fracture, it is found impossible to reach the required pressure after pumping a reasonable volume of grout at the minimum workable water-cement ratio or mortar grout with the maximum volume of sand at the minimum water-cementing materials ratio the speed of the pumping shall be reduced or pumping shall be stopped temporarily and intermittent grouting shall be performed, allowing sufficient time between grout injections for the grout to stiffen. Following such reduction in pumping speed, if the desired result is not obtained, grouting in the hole shall be discontinued when directed. In such event, the hole shall be cleaned, the grout allowed to set, and additional drilling and grouting shall then be done in this hole or in the adjacent area as directed, until the desired resistance is built up.

After the grouting of any stage of a hole is finished, the pressure shall be maintained by means of a stop-cock or other suitable device until the grout has set to the extent that it will be retained in the hole. Grout that cannot be placed, for any reason, within 2 hours after mixing shall be wasted. If such grout is mixed at the direction of the Contracting Officer or with his knowledge and consent, such wasted grout except as specified in paragraph 7-06a. shall be paid for at the contract unit prices for the materials contained therein.

(3) Equipment Arrangement and Operation. - The arrangement of the grouting equipment shall be such as to provide a continuous circulation of grout throughout the system and to permit accurate pressure control by operation of a valve on the grout return line, regardless of how small the grout take may be. The equipment and lines shall be prevented from becoming fouled by the constant circulation of grout and by the periodic flushing out of the system with water. Flushing shall be done with the grout intake valve closed, the water supply valve open, and the pump running at full speed.

(4) Protection to Work Cleanup. - Except as otherwise specified, no grouting will be permitted with 100 feet of installed perforated pipe or gravel filters for foundation drains. Where permitted in such locations, the contractor shall maintain a flow of water through the drains likely to be affected, to serve as tell-tales. In case leakage of grout into drains does occur, the contractor shall immediately stop the grouting operations and shall remove all grout from the drains affected by washing to the satisfaction of the Contracting Officer, and no separate payment will be made for such work. Such stopping of grouting operations and washing of drains shall be repeated as often as required to complete the curtain grouting. During grouting operations the contractor shall take such precautions as may be necessary to prevent drill cuttings, equipment exhaust oil, wash water, and grout, from defacing or damaging any permanent structure. The contractor will be required to furnish such pumps as may be necessary to care for waste water and grout from his operations. The contractor shall, upon completion of his operations, clean up all waste resulting from his operations that is unsightly or would interfere with the efficient operation of the project as anticipated by the original design.

g. Records. - The Contracting Officer will keep records of all grouting operations, such as a log of the grout holes, results of washing and pressure testing operations, time of each change of grouting operation, pressure, rate of pumping, amount of cement for each change in water-cement ratio, and other data as deemed by him to be necessary. The contractor shall furnish all necessary assistance and cooperation to this end.

h. Communications. - When, for his own convenience, the contractor has the individual elements of his plant so located that communication by normal voice between these elements is not satisfactory, the Contracting Officer may require him to install a satisfactory mechanical means of communication, such as a telephone or other suitable device.

7-06. MEASUREMENT AND PAYMENT. - a. General. - The contract prices for the various items of work and materials, as described in paragraphs 7-06b through 7-06i, shall constitute full compensation for mobilizing, demobilizing and furnishing all equipment necessary to

perform the drilling and grouting of the structure in accordance with these specifications; all drilling, washing and pressure testing of grout holes, care and disposal of waste water and waste grout, clean-up of the site, furnishing, handling, transporting and storing of grout materials, and for furnishing all labor and supplies incidental to the work. No payment will be made for grout, or the material constituents thereof, wasted due to improper anchorage of grout pipe or connections, or which is wasted due to negligence on the part of the contractor, nor for grout which is rejected by the Contracting Officer because of improper mixing. Payment will be made at the applicable contract unit prices for materials contained in grout which are wasted, where the wasting is not due to negligence on the part of the contractor.

b. Mobilization and Demobilization. - The cost of assembling all plant and equipment at the site preparatory to initiating the work and for removing it therefrom when the drilling and grouting program has been completed, will be made at the contract lump-sum price for Item "Mobilization and Demobilization". Sixty percent of the contract lump-sum price will be paid following completion of moving onto the site, including complete assembly in working order, of all equipment necessary to perform the required drilling and grouting operations. The remaining 40 percent of the contract lump-sum price will be paid when all equipment has been removed from the site. In the event that exploratory drilling is required in areas in which other drilling or grouting is not planned and at a time when the contractor is not performing work for which mobilization and demobilization is paid under Item, "Mobilization and Demobilization", and as approved by the Contracting Officer, separate mobilization and demobilization will be paid for at negotiated prices.

c. Drilling Grout Holes. - Drilling of grout holes will be measured for payment on the basis of the linear feet of holes actually drilled in concrete or rock, as shown on the drawings or as directed by the Contracting Officer. Payment for drilling grout holes will be made at the contract price per linear foot for Item "Drilling 1-1/2" (EX) Grout Holes".

d. Drilling Drain Holes. - Drilling of drain holes will be measured for payment on the basis of the linear feet of holes actually drilled in rock, as shown on the drawings or as directed by the Contracting Officer. Payment for drilling drain holes will be made at the contract price per linear foot for Item "Drilling 3" (NX) Drain Holes", and shall include all costs in connection with furnishing and installing all required asbestos cement pipe.

e. Drilling Exploratory Holes. - Drilling of exploratory holes will be measured for payment on the basis of the linear feet of holes actually drilled in concrete or rock, as directed by the Contracting

Officer. Payment for drilling exploratory holes will be made at the contract price per linear foot for Item "Drilling 3" (NX) Exploratory Holes".

f. Portland Cement in Grout. - Portland cement will be measured for payment on the basis of the number of cubic feet (94 pounds) of cement used in the grout satisfactorily placed in grout holes and in exploratory holes. Payment for cement will be made at the contract price per cubic foot for Item "Portland Cement in Grout".

g. Sand in Grout. - Sand in grout will be measured for payment on the basis of the number of cubic feet of sand, dry rodded measurement, used in the grout satisfactorily placed in grout holes or in exploratory holes. Payment for the sand will be made at the contract price per cubic foot for Item "Sand in Grout".

h. Placing Grout. - The operation of placing grout will be measured for payment on the basis of the number of cubic feet of materials, exclusive of water and regardless of the proportions of the mixes, measured individually, as specified in subparagraphs f and g, above, satisfactorily placed. Payment for placing grout in grout holes will be made at the contract price per cubic foot for Item "Placing Grout" which price shall constitute full compensation for proportioning the mix as directed by the Contracting Officer and mixing and injecting the grout, all as specified herein or as may be directed. Separate payment will be made for all materials used in grout in accordance with the provisions of paragraphs 7-06f and g.

i. Connections to Grout Holes. - All connections of the grout supply line to grout holes found necessary for the purpose of injecting grout, as determined by the Contracting Officer, will be paid for at the rate of five dollars and no cents ($5.00) for each connection. Payment for each such connection will be made, regardless of the amount of grout actually injected, at the established contract price per connection for Item "Connections to Grout Holes".

SECTION 8

ANCHOR BARS
(Items 25 & 26)
(Index)

SECTION 8

ANCHOR BARS
(Items 25 & 26)

8-01. GENERAL. - This section covers furnishing and installing anchor bars, complete.

8-02. EQUIPMENT. - All equipment shall be of a type, capacity and mechanical condition suitable for doing the work, as determined by the Contracting Officer.

8-03. DRILLING. - The contractor shall drill holes for anchor bars to such depths and in such directions as shown on the drawings or as directed. The minimum diameter of any hole shall be as indicated on the drawings.

8-04. SETTING ANCHORS. - All standing water shall be removed from the holes immediately before grouting and placing anchor bars. Each hole shall be filled with cement grout, with proper proportions or admixture similar and approved equal to "Embeco" as manufactured by the Master Builders of Cleveland, Ohio, and just enough water to produce a plastic mix, and the anchor bar shall be forced to the bottom of the hole while being vibrated by a concrete vibrating machine. Grouting of anchor bars shall be accomplished not less than six (6) days in advance of concrete operations to allow the grout to become properly set. Anchors shall be of types indicated and of sufficient length to extend the required depth into rock. Anchor bars which are found to be loose after the grout has set shall be replaced as directed by the Contracting Officer at the expense of the contractor. Anchors shall conform to the requirements of reinforcing steel as specified in Section, CONCRETE. Plates shall be of structural steel.

8-05. MEASUREMENT AND PAYMENT. - Measurement will be made by the number of anchor bars of each type and length set complete in place. Payment will be made at the applicable contract unit prices for Items 25 and 26, "Anchor Bars", which prices shall include full compensation for drilling and grouting of holes, furnishing cement, water and grout, and furnishing and setting of anchor bars to the required depth below the excavated rock surface and of sizes and types shown on the drawings. No payment will be made for additional length of anchor bars due to rock overbreak and all costs in connection therewith shall be included under the applicable contract unit prices for "Anchor Bars".

SECTION 9

CONCRETE
(Items 27 thru 31, Incl.)

INDEX

SECTION 9

CONCRETE
(Items 27 through 31, Incl.)

9-01. SCOPE OF WORK. - The work covered by this section consists of furnishing all material and equipment and performing all labor for the manufacture, forming, transporting, placing, finishing, and curing of concrete in the structures included in these specifications.

9-02. COMPOSITION. - a. Concrete shall be composed of portland cement, water, fine and coarse aggregate and an air-entraining admixture.

b. Concrete may be composed of portland blast furnace slag cement, water, fine and coarse aggregate and an air-entraining admixture, provided the contractor so indicates in the Unit Price Schedule at the time of opening of bids.

9-03. QUALITY. - The concrete mixtures will be designed by the Contracting Officer who will determine the required quality of the concrete for the structures covered by these specifications.

9-04. CEMENT. - a. General. - Cement shall be furnished in bulk or in cloth or paper bags. Only one color of cement shall be used in exposed concrete. Cement reclaimed from cleaning bags or leaky containers shall not be used.

b. Portland Cement. - Portland cement shall conform to Federal Specification SS-C-192d, Type II.

c. Portland-Blast Furnace Slag Cement. - Portland-blast furnace slag cement shall conform to Federal Specification SS-C-197b, Type IS. (MS) (MH)

d. Temperature of Cement. - The temperature of the cement as delivered to storage at the site, shall not exceed 150 degrees F.

e. Test Requirements. - Cement will be sampled at the mill or shipping point and stored in sealed bins pending completion of testing and shipment. Cement will also be sampled at the site of the work when determined necessary. Sampling and testing will be by and at the expense of the Government. No cement shall be shipped until notice has been given that the test results are satisfactory and all shipments will be made under supervision of the Government. If a bin fails, the contents may be resampled and tested at the contractor's expense. Unsealing and resealing of bins and sealing of railroad cars and other conveyances used for shipment will be done by or under the supervision of the Government. Cars or other conveyances will not be accepted at

the site of the work unless received with all seals intact. If cement is damaged in shipment, handling, or storage, it shall be promptly removed from the site of the work. Cement which has been in storage at the project site over four months shall not be used until retest proves it to be satisfactory.

f. Transportation of Bulk Cement. - When bulk cement is not unloaded from primary carriers directly into weathertight hoppers at the batching plant, transportation from the railhead, mill, or intermediate storage to the batching plant shall be accomplished in adequately designed weathertight trucks, conveyors, or other means which will protect the cement completely from exposure to moisture.

g. Storage. - Immediately upon receipt at the site of the work, cement shall be stored in a dry, weathertight and properly ventilated structure. All storage facilities shall be subject to approval and shall be such as to permit easy access for inspection and identification. Sufficient cement shall be in storage to complete any lift of concrete started. In order that cement may not become unduly aged after delivery, the contractor shall use any cement which has been stored at the site for 60 days or more before using cement of lesser age.

h. Source. - The contractor shall notify the Contracting Officer in writing of the source or sources from which the cement will be obtained at least 60 days in advance of the time when concrete placing is expected to begin. If cement is to be obtained from more than one mill, the notification shall state the estimated amount of cement to be obtained from each mill and the proposed schedule of shipments.

9-05. ADMIXTURES. - a. Air-entraining Admixtures. - (1) General. - The air-entraining admixture shall be any approved substance or compound which will produce only entrained air in the concrete as hereinafter specified. The air-entraining admixture shall be added to the batch in solution in a portion of the mixing water. This solution shall be batched by means of a mechanical batcher capable of accurate measurement and in such a manner as will insure uniform distribution of the admixture throughout the batch during the specified mixing period.

(2) Tests. The contractor shall notify the Contracting Officer in writing of the source from which the admixture will be obtained at least 60 days in advance of the time when concrete placing is expected to begin. The contractor shall provide satisfactory facilities for the ready procurement of adequate test samples. All tests for the evaluation and approval of an admixture will be made by and at the expense of the Government. The suitability of an air-entraining admixture for use will be based on tests prescribed in, and shall meet the requirements of, Corps of Engineers Serial No. CRD-C-13-55 and Rev. 1957-1958. An

air-entraining admixture which has been in storage at the project site for longer than 6 months or which has been subjected to freezing shall not be used until retest proves it to be satisfactory.

b. Accelerator. - When approved or directed, the contractor shall use 1 percent of calcium chloride, by weight, of the cement in concrete being placed when the weather is cold enough to require protection of the concrete from freezing. Calcium chloride shall meet the requirements of Federal Specification O-C-105a & Am-1, Type I or Type II. It shall be measured accurately and shall be added to the batch in solution in a portion of the mixing water. The use of calcium chloride in concrete shall in no way relieve the contractor of responsibility for compliance with the requirements of these specifications governing protection and curing of the concrete.

9-06. AGGREGATES. - a. Composition. - Fine aggregate shall consist of natural sand, manufactured sand, or a combination of natural and manufactured sands. Coarse aggregate shall consist of gravel, crushed gravel, crushed stone, or a combination thereof.

b. Sources and Evaluation of Testing. - Aggregates shall be produced from the approved sources listed in the SPECIAL CONDITIONS or from another source when approved in accordance with paragraph "Concrete Aggregate-Approved Sources" of the SPECIAL CONDITIONS and the technical provisions herein. If the contractor proposes to furnish aggregates from a source not previously approved, the Government will make such tests and other investigations as necessary to determine whether or not aggregates meeting the requirements of these specifications can be produced from the proposed source. The tests to which the aggregates will be subjected will include specific gravity, absorption, Los Angeles abrasion, soundness in magnesium sulfate, petrographic analyses, freezing and thawing in concrete, alkali-aggregate reaction, organic impurities, and any other tests that are necessary to demonstrate that concrete of acceptable quality can be produced from the materials proposed. These tests will be conducted in accordance with the applicable Corps of Engineers methods of test given in the Handbook for Concrete and Cement. When the contractor desires to use aggregates from a source not previously approved, suitable samples for quality evaluation shall be taken under the supervision of the Contracting Officer in accordance with Corps of Engineers Serial No. CRD-C 100-55 & Rev. 1958 & 1960 and shall be delivered in 80 pound lots packed in clean canvas bags to 424 Trapelo Road, Waltham 54, Mass. within 15 days after date of notice to proceed. Approximately 1,500 pounds of each size shall be required. Sampling and shipping of samples shall be at the contractor's expense.

c. Samples for Mix Designs. - Samples of the aggregates, representative of the materials approved for use in the work, shall be taken under the supervision of the Contracting Officer in accordance with Corps of Engineers Serial No. CRD-C-100-55 & Rev. 1958 & 1960 and

delivered in 80-pound lots in clean canvas bags securely tied and identified to 424 Trapelo Road, Waltham, Mass. by the contractor at his expense at least 90 days in advance of the time when the placing of concrete is expected to begin. Mix design studies and tests will be made by the Government and at its expense. Approximately 3,500 pounds of each size aggregate, 20 bags of cement, and 1 quart of air entraining agent shall be required. The cement or cements and air-entraining agent shall be those selected for the project.

d. Production Sampling and Testing. - During construction, aggregates will be sampled as delivered to the mixer to determine compliance with specification provisions. The contractor shall provide facilities and labor as may be necessary for the ready procurement of representative test samples. Samples will be obtained when directed by the Contracting Officer and under his supervision. The Government will test such samples at its expense using appropriate Corps of Engineers and ASTM test methods. Tests of aggregates at various stages in the processing and handling operations will be made at the discretion of the Contracting Officer.

e. Quality. - Aggregates, as delivered to the mixer, shall consist of clean, hard, and uncoated particles. Fines shall be removed from the coarse aggregates by adequate washing.

The aggregate shall conform to the following specific requirements:

(1) Grading. - (a) Fine Aggregate. - The grading and uniformity of the fine aggregate shall conform to the requirements as delivered to the mixers:

Sieve Designation, U.S. Standard Square Mesh	Percentage by Weight Passing
No. 4	95-100
No. 8	80-90
No. 16	55-75
No. 30	30-60
No. 50	12-30
No. 100	2-10

In addition to the grading limits shown above, the fine aggregate, as delivered to the mixer shall have a fineness modulus of not less than 2.40 nor more than 3.10. The grading of the fine aggregate shall also be controlled so that the fineness moduli of at least four of any five consecutive test samples of the fine aggregate as delivered to the mixer shall not vary more than 0.15 from the average fineness modulus of all samples taken during the first month's operation unless otherwise directed. The fineness modulus shall be determined by dividing by 100, the sum of

the cumulative percentages retained on U.S. Standard Sieves Nos. 4, 8, 16, 30, 50 and 100. At the option of the contractor, fine aggregate may be separated into two or more sizes or classifications, but the uniformity of grading of the separate sizes shall be controlled so that they may be combined throughout the job in fixed proportions established during the first month of operation.

(b) Coarse Aggregate. - The grading of the coarse aggregate within the separated size groups shall conform to the following requirements as delivered to the mixers. The size groups may be obtained by blending additional individual sizes to comply with the required gradations.

Sieve Size U.S. Standard Square Mesh	Percent by Weight Passing Individual Sieves	
	No. 4 to 3/4 in.	3/4 in to 1-1/2 in.
2 in.		100
1-1/2 in		90-100
1 in.	100	20-45
3/4 in	90-100	0-10
1/2 in.	55-75	-
3/8 in.	30-55	0-5
No. 4	0-5	-

(2). Particle Shape. - The shape of the particles in the fine aggregate and in the coarse aggregate shall be generally spherical or cubical. The quantity of flat and elongated particles in the separated size groups of coarse aggregate, as defined and determined by Corps of Engineers Serial No. CRD-C 119-53, shall not exceed 25 percent in any size group.

f. Storage. - Aggregates shall be stored adjacent to the batch plant in such manner as to prevent the inclusion of foreign materials in the concrete. Haul roads and areas surrounding stockpiles shall be treated with a dust palliative. Sufficient aggregate shall be maintained at the site at all times to permit continuous placement and completion of any lift of concrete started. Trucks, bulldozers or similar equipment shall not be allowed to operate on stockpiles.

g. Moisture Control. - All fine aggregate and the smallest size group of the coarse aggregate shall remain in free-draining storage at the site until a stable moisture content is obtained prior to use.

9-07. WATER. - Water for washing aggregates and for mixing and curing concrete shall be fresh and free from injurious amounts of oil, acids, salt, alkali, organic matter, or other deleterious substances as determined by Corps of Engineers Serial No. CRD-C 400-57.

9-08. PROPORTIONING OF CONCRETE. - a. Control. - The proportions of all material entering into the concrete shall be as directed. The proportions will be changed whenever such change is determined necessary to maintain the standard of quality required for the structures covered by these specifications and to meet the varying conditions encountered during construction.

b. Cement Content. - The cement content of the concrete for the various parts of the structure will range from an approximate minimum of 5 to an approximate maximum of 7 bags per cubic yard, depending on the size, type and gradation of aggregate used, and on the structural requirements.

c. Aggregate Content. - The amount and maximum size of aggregate to be used in the various parts of the structure shall be as directed. Concrete mixes will be designed using 1-1/2 inch and 3/4 inch maximum sizes and using the maximum amount of coarse aggregate available and placeable in the various parts of the structures.

d. Entrained-Air Content. - The total calculated air content of that portion of air-entrained concrete containing aggregate smaller than the 1-1/2 inch square mesh sieve shall be between 5 and 7 percent of the volume of the concrete based on measurements made on concrete immediately after discharge from the mixer (CRD-C 41-59). The quantity of air within this range shall be as directed and shall be changed whenever such change is determined necessary to meet the varying conditions encountered during construction.

9-09. BATCHING AND MIXING. - a. General. - The contractor shall provide a batching plant and concrete mixing equipment having a capacity of at least 150 cubic yards in eight hours.

b. Batching Plant. - (1) Location. - The batching plant may be located "on-site" or "off-site".

(2) Arrangement. - Separate bins or compartments shall be provided for fine aggregate, for the different sizes of coarse aggregate and for bulk cements when used. The compartments shall be of ample size and so constructed that the materials will be maintained separately under all working conditions. Aggregates may be weighed cumulatively in one weigh batcher on one scale. Bulk cement shall be weighed in a separate hopper. The cement hopper may be attached to a separate scale for individual weighing or may be attached to the aggregate hopper for cumulative weighing, provided there are separate beams or dials for cement and aggregates. If cement is weighed on the same scale as the aggregate, the cement shall be weighed first and all hoppers shall be empty and the scale shall be in balance before the weighing of the cement is begun. Water may be measured by weight or by volume. If measured by weight it

shall not be weighed cumulatively with any other ingredient. The plant shall be arranged so as to facilitate the inspection of all operations at all times. Suitable facilities shall be provided for readily obtaining representative samples of aggregate from each of the bins or compartments for test purposes. Delivery of materials from the batching equipment shall be within the following limits of accuracy:

Material	Percent
Cement	2
Water	2
Aggregate	3
Admixtures	3

When materials are weighed cumulatively, each limit above applies to the total weight in the batcher after the material corresponding to that limit has been batched.

(3) Water Batcher and Dispenser for Admixture. - Equipment for batching water and the air-entraining admixture shall be provided at the batching plant or included with the paving mixers or truck mixers as required for the type of plant used.

(a) Water Batchers. - A suitable water measuring device shall be provided which will be capable of measuring the mixing water within the specified requirements for each batch. The mechanism for delivering water to the mixers shall be such that leakage will not occur when the valves are closed. The filling and discharge valves for the water batcher shall be so interlocked that the discharge valve cannot be opened before the filling valve is fully closed.

(b) Dispenser. - A suitable device for measuring and dispensing the air-entraining admixture shall be provided. The device shall be capable of ready adjustment to permit varying the quantity of admixture to be batched. The dispenser of air-entraining admixture shall be interlocked with the batching and discharging operations of the water so that the batching and discharging of the admixture will be automatic. When the use of truck mixers make this requirement impracticable, the air-entraining admixture dispenser shall be interlocked with the sand batcher.

(4) Scales. - Adequate facilities shall be provided for the accurate measurement and control of each of the materials entering each batch of concrete. The accuracy of the weighing equipment shall conform to the applicable requirements of Federal Specification AAA-S-121b & Am-1 for such equipment. The contractor shall provide standard test weights and any other auxiliary equipment required for checking the operating performance of each scale, or other measuring device. Periodic tests shall be made in

the presence of a Government inspector in such a manner and at such intervals as may be directed. Upon completion of each check test and before further use, the contractor shall make such adjustments, repairs, or replacements as may be required to secure satisfactory performance. Each weighing unit shall include a visible springless dial, which shall indicate the scale load at all stages of the weighing operation, or shall include a beam scale with a beam balance indicator which will show the scale in balance at zero load and at any beam setting. The indicator shall have an over and under travel equal to at least 5 percent of the capacity of the beam. The weighing equipment shall be arranged so that the plant operator can conveniently observe all dials or indicators.

c. Concrete Mixers. - Mixers may be stationary drum or turbine mixers, truck mixers, or paving mixers of approved design. The mixers shall have a rated capacity of at least 27 cubic feet of mixed concrete, and shall not be charged in excess of the capacity recommended by the manufacturer. Mixers shall be capable of combining the materials into a uniform mixture and of discharging this mixture without segregation. Each stationary and paving mixer shall be provided with an acceptable device to lock the discharge mechanism until the required mixing time has elapsed. Truck mixers shall be equipped with accurate revolution counters, and water measuring devices. Water meter, Nepture Type "S" or equal is acceptable. The mixers shall be operated at the drum or blade speed designated by the manufacturer on the name plate. The mixing periods specified herein are predicated on proper control of the speed of rotation of the mixer drum or mixing blades and on proper introduction of the materials into the mixer. The mixing time will be increased when such increase is necessary to secure the required uniformity of the concrete, or when tests of samples of concrete taken from the first, middle and last portions of the mixer discharge exceed any of the following uniformity requirements when tested in accordance with the provision of CRD-C 55-61. When authorized, the mixing time may be reduced to the minimum time required to meet all the following requirements:

Test	Maximum Allowable Variation of any one test value from the average of three
Water content of mortar, by weight	5.0%
Coarse aggregate content of concrete, by weight	5.0%
Unit weight of air-free mortar	0.8%
Cement content of dried mortar, by weight	10.0%

Excessive overmixing requiring additions of water, will not be permitted. The mixers shall be maintained in satisfactory operating condition, and

mixer drums shall be kept free of hardened concrete. Mixer blades shall be replaced when worn down more than 10 percent of their depth. Should any mixer at any time produce unsatisfactory results, its use shall be promptly discontinued until it is repaired. Suitable facilities shall be provided for obtaining representative samples of concrete for uniformity tests. All necessary platforms, tools, and equipment for obtaining samples shall be furnished by the contractor.

(1) Stationary Mixers. - If no uniformity test data are available, the mixing time for each batch after all solid materials are in the mixer, provided that all of the mixing water is introduced before one-fourth of the mixing time has elapsed, shall be one minute for mixers having a capacity of one cubic yard; for mixers of larger capacities, the minimum mixing time shall be increased 15 seconds for each additional one-half cubic yard or fraction thereof of concrete mixed. When a stationary mixer is used for partial mixing of the concrete (shrink mixing) the mixing time in the stationary mixer may be reduced to the minimum necessary to intermingle the ingredients (about 30 seconds).

(2) Truck Mixers. - Truck mixers shall conform to the requirements of Federal Specification SS-C-618a. When a truck mixer is used either for complete mixing (transit-mixed) or to finish the partial mixing done in a stationary mixer, in the absence of uniformity test data, each batch of concrete shall be mixed not less than 70 nor more than 100 revolutions of the drum at the rate of rotation designated by the manufacturer of the equipment as mixing speed and at the capacity designated in Federal Specification SS-C-618a. If the batch is at least 1/2 cubic yard less than the rated capacity, in the absence of uniformity test data, the number of revolutions at mixing speed may be reduced to not less than 50. Any additional mixing shall be done at the speed designated by the manufacturer of the equipment as agitating speed. When necessary for proper control of the concrete, mixing of transit mixed concrete will not be permitted until the truck mixer is at the site of the concrete placement.

(3) Paving Mixers. - Paving mixers shall be located adjacent to concrete placement area. Paving mixers shall be equipped with boom and bottom-dump bucket to handle the concrete from the mixer to the form. The bucket will be of adequate size to handle the complete batch of concrete mixed, and the boom shall be of sufficient length to permit discharge of the concrete into its final position in the form. Boom may be replaced by an acceptable crane. Paving mixers may be either single compartment drum or multiple compartment drum type. A sled or box of suitable size shall be attached to the mixer under the bucket so as to catch any spillage of concrete that may occur when the mixer is discharging concrete into the bucket. Multiple compartment drum paving mixers shall be properly synchronized, and the mixing time shall be determined by including

the time required to transfer the concrete between compartments of the drum. If no uniformity test data are available, the mixing time for each batch, after all solid materials are in the mixer drum, provided that all the mixing water is introduced before one-fourth of the mixing time has elapsed, shall be one minute for mixers having a capacity of one cubic yard; for mixers of larger capacities, the minimum mixing time shall be increased 15 seconds for each additional 1/2 cubic yard or fraction thereof of concrete mixed. Vehicles used in transporting material from the batching plant to the mixers shall have bodies or compartments of adequate capacity to carry the materials and to deliver each batch, separate and intact, to the mixer. Except as otherwise approved by the Contracting Officer, loose cement shall be transported from the batching plant to the mixers in separate boxes or compartments which shall be equipped with windproof and rainproof covers.

9-10. CONVEYING. - Concrete shall be conveyed from mixer to forms as rapidly as practicable, by methods which will prevent segregation or loss of ingredients. Any wet batch hopper through which the concrete passes shall be conical in shape. There shall be no vertical drop greater than 5 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Belt conveyors, chutes, or other similar equipment will not be permitted for conveying concrete. Truck mixers or agitators used for transporting central mixed concrete shall conform to the applicable requirements of Federal Specification SS-C-618a. Methods and equipment for handling and depositing the concrete in the form shall be subject to the approval of the Contracting Officer. There shall be provided indicating and signaling devices, utilizing both audible and visual mediums, for the control of identification of types or classes of concrete as they are mixed and discharged into buckets for transfer to the forms. Each type or class of concrete shall be visually identified by placing a colored tag or marker on the bucket as it leaves the mixing plant so that the concrete may be positively identified in the forms and placed in the structure in the desired position. Telephonic or other satisfactory means of rapid communication between the mixing plant and the forms in which concrete is being placed shall be provided and made available for use by the inspectors in the mixing plant and forms.

9-11. PLACING. - a. General. - Concrete shall be worked into the corners and angles of the forms and around all reinforcement and embedded items without permitting the material to segregate. Concrete shall be deposited as close as possible to its final position in the forms. Placing the concrete shall, as far as practicable, be done by means of bottom-dump buckets. The design of the buckets shall be such that the ratio of the area of the clear gate opening or gate throat opening is not less than one-third the maximum interior horizontal area. The design of the bucket shall also provide means for positive regulation of

the amount and rate of deposit of concrete in each dumping position. The depositing of concrete by any method used shall be regulated so that the concrete may be effectively compacted with a minimum of lateral movement into horizontal layers approximately 1-1/2 feet in thickness. Not more than four cubic yards may be deposited in one pile for compaction. The surface of construction joints shall be kept continuously wet for at least twelve hours during the twenty-four hour period prior to placing concrete. Free water shall be removed prior to placement of mortar and additional concrete. All approximately horizontal surfaces shall be covered by a layer of mortar of the composition directed. Concrete shall then be placed immediately upon the fresh mortar. All concrete placing equipment and methods shall be subject to approval. Concrete placement will not be permitted, when, in the opinion of the Contracting Officer, weather conditions prevent proper placement and consolidation.

b. Time Interval between Mixing and Placing. - Concrete shall be placed within thirty minutes after it has been mixed, unless otherwise authorized.

c. Placing Temperature. - Concrete, when deposited in the forms during cold weather, shall have a temperature of not less than 50 degrees F. nor more than 70 degrees F. Heating of the mixing water or aggregates will not be permitted until the temperature of the concrete has decreased to 50 degrees F. The materials shall be free from ice, snow, and frozen lumps before entering the mixer. All methods and equipment shall be subject to approval. When heating is necessary to keep the concrete temperature above 50 degrees F, it shall be regulated so that the concrete temperature does not exceed 70 degrees F. All concrete placed during warm weather shall be delivered to the forms at the coolest temperature which is practicable to produce under current conditions but not above 85 degrees F.

d. Concrete on Earth Foundations. - Earth foundation upon which concrete is to be placed shall be clean, damp, and free from frost, ice, and standing or running water. Prior to placing concrete the earth foundation shall have been satisfactorily compacted in accordance with the provisions of sections covering excavation and fills.

e. Concrete on Rock Foundations. - Rock surfaces upon which concrete is to be placed shall be clean, free from oil, standing or running water, ice, mud, drummy rock, coatings, debris, loose semi-detached or unsound fragments. Faults or seams shall be cleaned to a satisfactory depth and to firm rock on the sides. Immediately before concrete is placed, all rock surfaces shall be cleaned thoroughly by the use of wet sandblasting or other approved methods. All devices necessary to produce a foundation free of running or standing water shall be installed by the contractor and securely fastened in place so as to prevent their being jarred loose by concrete placement. The devices and methods of installation shall be approved. All rock surfaces shall be kept

continuously wet for at least 24 hours, immediately prior to placing concrete thereon. All approximately horizontal surfaces shall be covered, immediately before the concrete is placed, with a layer of mortar of the composition directed.

f. Lift in Concrete. - The depth of concrete placed in each lift will be as shown on the drawings or specified herein. All concrete shall be deposited in approximately horizontal layers about 1-1/2 feet in thickness unless otherwise specifically authorized or directed. The placement shall be carried on at such a rate that the formation of cold joints will be prevented. Slabs shall be placed in one lift unless otherwise authorized or directed. In walls, lifts including door and window openings shall terminate at the top and bottom of the openings unless architectural details indicate otherwise, and other lifts shall terminate at such levels as will conform to architectural details.

g. Vibration of Concrete. - Concrete shall be compacted with mechanical vibrating equipment supplemented by handspading and tamping. In no case shall vibrators be used to transport concrete inside the forms. The vibrating equipment shall be of the internal type and shall at all times be adequate in number of units and power of each unit to properly consolidate all concrete. Form or surface vibrators shall not be used unless specifically approved. Internal vibrators shall maintain a frequency when submerged in the concrete of not less than 6,000 impulses per minute for spuds with diameters greater than 5-inches and 7,000 impulses for smaller spuds. The intensity (amplitude) of vibration shall be sufficient to produce satisfactory consolidation. The duration of vibration shall be limited to that necessary to produce satisfactory consolidation. The manipulation of the concrete adjacent to the surface of a lift in connection with completing lift placement shall be the minimum necessary to produce the required consolidation. Excessive surface working will not be permitted. Coarse gravel protruding from the surface of the lift shall be "walked down" into the mass during the initial vibrating operations.

h. Placing Concrete through Reinforcement. - In placing concrete through reinforcement, care shall be taken that no segregation of the coarse aggregate occurs. On the bottom of beams and slabs, where the congestion of steel near the forms makes placing difficult, a layer of mortar of the composition directed shall be first deposited to cover the surface to a depth of approximately one inch.

i. Placing Concrete in Ogee Crest and Spillway Buckets. - The unformed portion of the ogee crest and spillway bucket which is to be finished shall be carried slightly above grade and struck off to grade by accurately screeding. Screeding may be accomplished by semimechanical devices or by a mechanical screed which consolidates and screeds the surface in one operation. Ribs embedded in the fresh concrete as guides for screeds will not be permitted.

j. Non-Shrink Concrete. - Non-shrink concrete for filling blockout for gate shall consist of 1 part cement, 7 part sand and 1.5 parts of 1/4 inch gravel aggregate, and 15% (by weight of cement) of a metallic aggregate, similar or approved equal to "Embeco" as manufactured by Masters Builders Company.

9-12. CONSTRUCTION JOINT TREATMENT. - a. General. - As a lift is completed, the top surface shall be immediately and carefully protected from any condition that will damage the concrete.

b. Cleaning. - Horizontal construction joints on lifts shall be prepared for receiving the next lift by cleaning with wet sandblasting. Approved wet sandblasting equipment shall be provided.

(1) Wet Sandblasting. - Wet sandblasting shall be performed immediately before placing the following lift. The operation shall be continued until all unsatisfactory concrete, and all laitance, coating, stains, debris, and other foreign materials are removed. The surface of the concrete shall then be washed thoroughly to remove all loose material.

(2) Waste Disposal. - The method used in disposing of waste water employed in cutting, washing and rinsing of concrete surfaces shall be such that the waste water does not stain, discolor, or affect exposed surfaces of the structures. Methods of disposal shall be subject to approval.

9-13. EXPANSION, CONTRACTION AND VERTICAL CONSTRUCTION JOINTS. - a. General. - Joints shall be provided at the locations indicated on the drawings and according to the details shown or as otherwise approved. The methods and materials used shall be subject to approval and the materials shall conform to Federal Specifications wherever applicable. In no case shall any fixed metal, embedded in concrete, be continuous through an expansion or contraction joint.

b. Joint Fillers. - Where indicated on the drawings, expansion joint filler conforming to Federal Specification HH-F-341a, type I, Class B, thickness as indicated, shall be installed. Expansion joints sealer shall conform to Federal Specification SS-S-159b. Fibrous mastic shall conform to Federal Specification SS-C-153, Type I, shall be heavily fibered with asbestos fibers, shall be suitable for use without priming concrete, and shall be troweled to a minimum thickness of 1/8 inch (unless otherwise shown) applied in two equal applications which shall be continuous over the entire surface.

c. Waterstops. - Waterstops of natural rubber, a suitable synthetic rubber, a blend of natural and syrthetic rubber or of polyvinyl-chloride (PVC) shall be installed in joints as shown on the drawings or as otherwise directed. Rubber waterstops shall comply with the requirements

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of Corps of Engineers Serial No. CRD-C-513-60. Polyvinlychloride water stops shall conform to the requirements of Corps of Engineers Serial No. CRD-C-572-61. The location, dimensions, and method of installation shall be as shown on the drawings and as required. Joints and splices shall be as follows:

(1) Rubber. - Joints in rubber waterstops shall be vulcanized.

(2) Polyvinylchloride. - Splices in the continuity or at the intersections of runs of PVC waterstops shall be performed by heat sealing the adjacent surfaces in accordance with the supplier's recommendations. A thermostatically controlled electric source of heat shall be used to make all splices. The correct temperature at which splices should be made will differ with the material concerned but should be sufficient to melt but not char the plastic. All splices shall be neat with the ends of the joined materials in true alignment. A temporary shop and bench will be provided at the site of the installation and in every possible instance splices will be made on the bench in the shop. All intersection splices will be prefabricated at the manufacturer's plant or on the bench in the field shop. A miter-box guide and portable power saw shall be provided and used to cut the ends to be joined to insure good alignment and contact between joined surfaces. After splicing, a remolding iron with ribs and corrugations to match the pattern of the waterstop shall be used to re-form the ribs at the splice. The continuity of the characteristic members of the cross sections of the waterstop designs (ribs, tubular center axis, protrusions, and the like) shall be maintained across the splice.

(3) Installation. - In order to eliminate faulty installation that may result in joint leakage, particular care shall be taken to see that the waterstops are correctly positioned during installations. The bottom of each waterstop shall be embedded a minimum 6-inches in firm rock or sealed to other cutoff systems. All waterstops shall be installed so as to form a continuous watertight diaphragm in each joint. Adequate provision shall be made to support and completely protect the waterstops during the progress of the work. The contractor shall replace or repair, at his expense, any waterstops punctured or otherwise damaged before final acceptance of the work. Maximum density and imperviousness of the concrete shall be insured by thorough working of the concrete to be used in the vicinity of all joints. Suitable guards shall be provided to protect exposed projecting edges and ends of partially embedded waterstops from mechanical damage during periods of low temperature when concrete placement has been discontinued.

9-14. FINISHING. - a. General. - Immediately after removal of forms, all unsightly ridges or lips shall be removed and undesirable local bulging on the surfaces to be permanently exposed shall be remedied. Excessive rubbing of formed surfaces will not be permitted. Voids and holes left

by the removal of tie rods in all permanently exposed surfaces and surfaces to be exposed to water shall be reamed and completely filled with dry-patching mortar (preshrunk) mixed in the proportions directed. The cement used in the mortar shall be a blend of portland cement and white portland cement properly proportioned so that the final color of the cured mortar will be the same as the color of the surrounding concrete. Defective concrete shall be repaired by cutting out the unsatisfactory material and placing new concrete which shall be secured with keys, dovetails or anchors. Concrete for patching shall be drier than the usual mixture and shall be thoroughly tamped into place. All unformed surfaces of concrete shall have a wood float finish, unless a steel trowel finish is specified without additional mortar and shall be true to elevation as shown on the drawings. Care shall be taken to see that all free water which has accumulated at the surface is removed before making any finish. Other surfaces shall be brought to the specified elevation and left true and regular. Where indicated on the drawings, joints shall be carefully made with a jointing tool. Every precaution shall be taken by the contractor to protect finished surfaces from stains or abrasions. Surfaces or edges likely to be injured during the construction period shall be properly protected.

b. Unformed Surfaces. - The bubble gage building floor, the inlet structure transition and the outlet works basin shall be given a steel trowel finish. Where a wood float finish is indicated or specified, floating shall be started as soon as the screeded surface has stiffened sufficiently to permit floating and shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture. Floating may be performed by use of hand or power driven equipment. Where a steel-trowel is indicated or specified, troweling shall be performed as soon as the floated surface has hardened sufficiently to prevent an excess of fine material from being drawn to the surface. Steel troweling shall be performed with firm pressure to produce a dense, uniform surface, free from blemishes and trowel marks. Surfaces shall be sloped for drainage where shown on the drawings or directed. Dusting of fresh concrete with dry cement prior to finishing will not be permitted.

c. Surface Irregularities. - Surface irregularities of either a floated or wood troweled finish shall not exceed 1/4-inch as measured with a 10 foot template. Steel troweled finish shall not exceed one-eights inch as measured with a ten foot template.

d. Nonslip finish. - Nonslip finish shall be given to exterior stair treads, and roof of bubble gage structure. The concrete shall be finished by tamping with special tools to force the coarse aggregate from the surface, then screeding and floating to bring the surface to the required level. The concrete while still plastic, shall be wood floated and brushed in a direction transverse to the traffic with a camel hair broom to produce a surface having a rough texture providing an approved non-slip finish.

9-15. CURING AND PROTECTION. - a. General. - All concrete shall be cured by an approved method or combination of methods for the period of time given below corresponding to the cementing materials used in the concrete:

Type II portland cement or
portland blast furnace slag cement (MS) (MH) 14 days

The contractor shall have all equipment needed for adequate curing and protection of the concrete on hand and ready to install before actual concrete placement begins. The curing medium and method, or the combination of mediums and methods used, shall be approved in writing. The curing medium shall be applied so as to prevent loss of moisture from the concrete. Concrete shall be protected from heavy rains for 12 hours, flowing water for 14 days and direct rays of the sun for 3 days. All concrete shall be adequately protected from damage. No fire or excessive heat shall be permitted near or in direct contact with concrete at any time. All galleries, conduits and other formed openings through the concrete shall be closed during the entire construction period.

b. Moist Curing. - All concrete herein shall be moist-cured by maintaining all surfaces continuously (not periodically) wet for the duration of the entire curing period, except that horizontal construction joints may be allowed to dry for twelve hours immediately prior to the placing of the following lift. Water-curing shall conform to the requirements of paragraph 9-07. All surfaces of concrete, which are to be permanently exposed, shall be cleaned if a water is used which stains the surfaces. Where forms of tongue-and-groove or shiplap sheathing are used and left in place during curing, the sheathing shall be kept wet at all times. Horizontal construction joints and finished horizontal surfaces cured with sand shall be covered with a minimum uniform thickness of 2 inches of sand which shall be kept continuously saturated.

c. Membrane Curing. - At the option of the contractor, concrete in the following structures or portions of structures may be cured with an approved pigmented curing compound of the surface membrane type in lieu of moist curing with water:

Concrete surfaces to be covered with backfill.

The pigmented curing compound shall conform to Corps of Engineers Serial No. CRD-C 300-59. Concrete in the Bubble Gage Shelter may be cured with an approved clear curing compound:

The clear compound shall conform to Corps of Engineers Serial No. CRD-C-300-59, except that the reflectance requirement shall be waived. When directed by the Contracting Officer, concrete cured with a clear compound shall be shaded from the direct rays of the sun for the first 7 days of the curing period. The curing compound shall be applied to formed surfaces immediately after the forms are removed and prior to any patching or

other surface treatment except the cleaning of loose sand, mortar, and debris from the surface. The surfaces shall be thoroughly moistened with water and the curing compound applied as soon as free water disappears. The curing compound shall be applied to unformed surfaces as soon as free water has disappeared. The curing compound shall be applied in a 2-coat continuous operation by approved power-spraying equipment and at a uniform coverage of not more than 400 sq. ft. per gallon for each coat. Concrete surfaces which are subject to heavy rainfall within 3 hours after curing compound has been applied shall be resprayed by the method and at the coverage herein specified. All concrete surfaces, on which the curing compound has been applied, shall be adequately protected for the duration of the entire curing period from pedestrian and vehicular traffic and from any other cause which will disrupt the continuity of the curing membrane.

d. Cold Weather. - The air and forms in contact with concrete sections having a minimum dimension less than 12 inches shall be maintained at a temperature above 50 degrees F for at least the first 3 days and at a temperature above freezing for the remainder of the specified curing period. Concrete in more massive sections shall be maintained at temperatures above 40 degrees F for at least the first 3 days and at a temperature above freezing for the remainder of the specified curing period. The temperature protection equipment the curing water and the removal of forms shall be handled in such a manner that the surface concrete will not be subjected to a temperature differential of more than 25 degrees F. as determined by observation of ambient and concrete surface temperatures indicated by the suitable self reading thermometers, furnished by the contractor and installed under the supervision of the Contracting Officer outside of the concrete and 2 inches inside the surface of the concrete. The installation of the thermometers shall be made by the contractor at such locations as may be directed. Concrete permitted to be cured with curing compounds shall be provided the same protection against freezing and low temperatures as provided herein for moist-cured concrete. Curing compounds shall not be used on concrete surfaces which are maintained at curing temperatures by the use of free steam.

9-16. FORMS AND FORMED SURFACES. - a. General. Forms shall be true to line and grade, mortar-tight and sufficiently rigid to prevent objectionable deformation under load. That portion of the form in contact with the concrete shall not be of a material which interferes with the setting of the concrete. Where forms for continuous surfaces are placed in successive units, care shall be taken to fit the forms over the completed surface so as to obtain accurate alignment of the surface and to prevent leakage of mortar. Responsibility for their adequacy shall rest with the contractor; however, the type, shape, size, quality, and strength of all materials of which the forms are made shall be subject to specific approval. Bolts and rods used for internal ties shall be so arranged, that when the forms are removed, metal will be not less than 2 inches from any concrete surface. Wire ties will not be permitted where

the concrete surface will be exposed to weathering and where discoloration will be objectionable. All forms shall be so constructed that they can be removed without damaging the concrete. All exposed joints, edges, and external corners shall be chamfered and dummy chamfers and false joints shall be used to provide a neat and uniform appearance, unless otherwise directed or indicated on the drawings.

b. Surface Finish Requirements. - The class of finish required for the various surfaces of the structures shall be as herein specified or indicated on the drawings. Allowable irregularities are designated "abrupt" and "gradual" for purposes of providing tolerances. Offsets resulting from displaced, misplaced or mismatched forms, or sheathing, or by loose knots in sheathing, or other similar form defects, shall be considered "abrupt", irregularities. Irregularities resulting from warping, unplaneness and similar uniform variations from planeness, or true curvature, shall be considered "gradual" irregularities will be checked for conformance with the prescribed tolerances by means of 5-foot templates composed of a straight edge for plane surfaces, or a "shaped" template for curved and warped surfaces. The requirements for the classes of finish specified on the drawings and for the types of form materials permitted for each class shall be as specified below:

(1) Class "A" Finish. - Class "A" finish shall be given to the exterior of the Bubble Gage Structure and adjacent stair vertical surfaces. Where class "A" finish is specified, the sheathing shall be composed of well-matched tight-fitting tongue and groove lumber. If necessary, the sheathing shall be sanded to remove imperfections and to provide a form surface which will produce a concrete surface meeting the following tolerances: "Abrupt" irregularities shall not exceed 1/8-inch. "Gradual" irregularities shall not exceed 1/4-inch in 5 feet determined in the specified manner.

(a) In addition, the exterior of the bubble gage structure and adjacent stairs exposed to view shall be given a rubbed finish as follows:

i. Immediately after removal of the forms all fins, form marks and similar blemishes and loose material shall be removed; honeycomb, aggregate pockets, voids, and holes over 1/2 inch in diameter shall be cut out to solid concrete, thoroughly wetted, brush coated with neat cement grout, and filled with cement mortar composed of 1 part light-colored portland cement or a combination of white and normal cement, if required, to match the color of the adjacent concrete, to 2 parts fine aggregate. Mortar shall be placed in layers as required, and each layer shall be thoroughly compacted in place. The final layer shall be finished flush and in the same plane as adjacent surfaces. Patchwork shall be damp cured for 72 hours. Exposed patchwork shall be rubbed or otherwise treated to match adjacent surfaces.

2. The surfaces shall then be thoroughly wetted and brush coated with cement grout composed of 1 part light-colored portland cement or a combination of white and normal cement, if required, to match the color of the adjacent concrete, to 2 parts fine aggregate mixed with water to the consistency of thick paint. Grout shall be cork-floated to fill all pits, air bubbles, and surface holes. Excess grout shall be scraped off with a trowel. In hot, dry weather, the grout shall be kept damp by means of fog spray during the setting period. The finish for any area shall be completed in the same day and the limits of a finished area shall be made at natural breaks in the finished surface.

3. Within twenty-four (24) to forty-eight (48) hours after the above work is completed, the surfaces shall be rubbed with carborundum stones and water. No mortar or grout shall be employed during rubbing, and mortar that is worked up during rubbing shall be removed by brushing, burlap rubbing or other approved methods. The resulting surfaces shall be left uniformly smooth and washed clean.

4. The contractor shall pour for approval a sufficient number of sample concrete panels to show the rubbed finish required. Each panel shall be not less than 6 feet long by 4 feet high. Pouring of concrete requiring the finish indicated by the samples shall not proceed until the sample panel has been approved.

(2) Class "B" finish. - Class "B" finish shall be given to all concrete surfaces, except where Class "A" or Class "D" finish is specified. Where Class "B" finish is specified, the sheathing may be composed of tongue and groove lumber, shiplap, plywood, concrete form board, or steel. Steel lining on wood sheathing will not be permitted. The sheathing shall provide a surface which will produce a concrete surface meeting the following tolerances: "Abrupt" irregularities shall not exceed 1/4-inch and "gradual" irregularities shall not exceed 1/2 inch in 5 feet determined in the specified manner.

(3) Class "D" finish. - Class "D" finish shall be given to all concrete surfaces against which backfill or concrete is to be placed. Where class "D" finish is specified, the sheathing may be of wood, or steel, or may be steel lined. "Gradual" and/or "abrupt" irregularities shall not exceed 1-inch.

c. Construction Tolerances.- Variations in alignment, grade and dimensions of the structures from the established alignment, grade and dimensions shown on the drawings shall be within the tolerances specified in the following tables:

TABLE I

CONSTRUCTION TOLERANCES FOR CONCRETE CONSTRUCTION

(1) Variation from the plumb:	
a. In the lines and surfaces of columns, piers, walls, and in arrises	In 10 feet . . . . . 1/4 inch In any story or 20 feet maximum . . . . 3/8 inch In 40 feet or more . . . 3/4 inch
b. For exposed corner columns, control-joint grooves, and other conspicuous lines	In any bay or 20 feet maximum . . . 1/4 inch In 40 feet or more . . . 1/2 inch
(2) Variation from the level or from the grades indicated on the drawings:	
a. In floors, ceilings, beam soffits, and in arrises	In 10 feet . . . . . 1/4 inch In any bay or 20 feet maximum . . . . 3/8 inch In 40 feet or more . . . 3/4 inch
(3) Variation of the linear building lines from established position in plan and related position of columns, walls, and partitions	In any bay or 20 feet maximum . . . 1/2 inch In 40 feet or more . . . 1 inch
(4) Variation in the sizes and locations of sleeves, floor openings, and wall openings	. . . . . 1/4 inch
(5) Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls	Minus . . . . . 1/4 inch Plus . . . . . 1/2 inch
(6) Footings:	
a. Variation of dimensions in plan	Minus . . . . . 1/2 inch Plus . . . . . 2 inches
b. Misplacement or eccentricity	2 percent of the footing width in the direction of misplacement but not more than . . . . . 2 inches
c. Reduction in thickness	Minus . . . . . 5 percent of specified thickness
(7) Variation in steps:	
a. In a flight of stairs	Rise . . . . . 1/8 inch Tread . . . . . 1/4 inch
b. In consecutive steps	Rise . . . . . 1-1/16 inch Tread . . . . . 1/8 inch

d. Coating. - An approved colorless mineral oil, not darker than ASTM No. 3 in accordance with ASTM D-1500, free of kerosene, with a viscosity of not less than 70 seconds nor more than 110 seconds (Saybolt Universal) at 100 degrees F., except that when used on hardboard forms, the viscosity shall be not less than 250 seconds at 100 degrees F. Flash point shall be not less than 300 degrees F. (Open cup). Viscosity and flash point shall be determined in accordance with ASTM Standards D 88 and D 92, respectively. Certified copies of results of laboratory tests performed by an approved commercial laboratory shall be submitted for approval. After oiling, surplus oil on the form surfaces and any oil on the reinforcing steel or other surfaces requiring bond with the concrete shall be removed. Forms for unexposed surfaces may be thoroughly wetted in lieu of oiling immediately before the placing of concrete, except that in freezing weather oil shall be used.

e Removal. - Forms shall not be removed without approval, and all removal shall be accomplished in a manner which will prevent injury to the concrete. Forms shall not be removed before the expiration of the minimum time indicated below, except as otherwise directed or specifically authorized.

Conduit roofs	144 hr
Beams and deck-type slabs	144 hr
Walls (lifts 15. ft. and under)	24 hr
Walls (lifts over 15 ft.)	48 hr
Mass concrete (face)	36 hr
Mass concrete (bulkhead)	48 hr

When conditions on the work are such as to justify the requirement, forms will be required to remain in place for longer periods.

9-17. FURNISHING AND PLACING STEEL REINFORCEMENT. - a. General. - The contractor shall furnish, cut, bend, and place all steel reinforcement including rods, fabric and structural shapes as indicated on the drawings or as otherwise required. All reinforcement shall be, when surrounding concrete is placed, free from loose, flaky rust, and scale, and free from oil, grease or other coating which might destroy or reduce its bond with the concrete. The contractor shall submit for approval shop drawings, bar lists and bending diagrams. Contract drawings show the basic steel requirements and are not necessarily complete as to layout of reinforcing steel. The contractor shall furnish complete steel placement shop drawings elaborating whatever necessary over what is shown on the contract drawings.

b. Cutting and Bending. - Steel reinforcement may be mill or field bent. All bending shall be in accordance with standard approved practice and by approved machine methods.

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c. Reinforcement. - (1) Reinforcing steel for concrete shall conform to the requirements of ASTM Specification A15-58T, intermediate billet, deformed. Rail steel, ASTM Specification A16-59T, regular grade, deformed, or hardgrade billet steel, ASTM Specification A15-58T, deformed, may be furnished for straight bars or shop bends only. Certified copies of all mill reports shall accompany all deliveries of reinforcing steel.

(2) Mesh reinforcement. - Mesh reinforcement shall conform to the requirements of ASTM Specification A185-58T, and unless otherwise indicated on the drawing, shall be 6-inch by 6-inch mesh of No. 6 gage wire.

d. Spacing of Bars. - The spacing of bars shall be as shown on the contract drawings or as directed, and shall conform to the tolerances shown in Table II.

e. Relation of Bars to Concrete Surfaces. - The minimum cover for all main reinforcement shall conform to the dimensions shown on the drawings within the tolerances shown in Table II. The dimensions, as shown on the drawings, indicate the clear distance from the edge of the main reinforcement to the concrete surface. The concrete covering of stirrups, spacer bars, and similar secondary reinforcement may be reduced by the diameter of such bars.

TABLE II

CONSTRUCTION TOLERANCE FOR PLACING REINFORCING STEEL

(1)	Variation of protective covering	With 2-inch cover - - - 1/4 inch With 3-inch cover - - - 1/2 inch
(2)	Variation from indicated spacing	- - - - - - - - - - - - -1 inch

f. Splicing. - All splices in reinforcement shall be as shown on the drawings. Lapped ends of bars may be placed in contact and securely wired or may be separated sufficiently to permit the embedment of the entire surface of each bar in concrete. Adjacent sheets of mesh reinforcement shall be spliced by lapping not less than 6 inches, the lapped ends being securely wired or cliped together with standard clips.

g. Supports. - All reinforcement shall be secured in place by use of metal or concrete supports, spacers or ties, as approved. Such supports shall be of sufficient strength to maintain the reinforcement in place throughout the concreting operation. The supports shall be used in such manner that they will not be exposed or contribute in any way to the discoloration or deterioration of the concrete.

9-18. EMBEDDED ITEMS. - Before placing concrete, care shall be taken to determine that all embedded items are firmly and securely fastened in place as indicated on the drawings, or required. Embedded items pipe and conduit shall be free of oil and other foreign matter such as loose coatings of rust, paint, and scale. The embedding of work in concrete will be permitted only when specifically authorized or directed.

9-19. MEASUREMENT AND PAYMENT. - a. Concrete. - Measurement of concrete will be made on the basis of the actual volume of concrete within the lines and grades of the structures as indicated on the drawings. Measurement of concrete placed against the sides of any excavation without the use of intervening forms will be made only within the indicated limits. No deductions will be made for rounded or beveled edges or space occupied by metal work, electrical conduits or timber, nor for voids or embedded items which are either less than 5 cubic feet in volume or one square foot in cross section. Unless otherwise specified, payment for concrete will be made at the respective contract prices per cubic yard for the various items of the schedule, which price shall include the cost of all labor, materials, and the use of all equipment and tools required, to complete the concrete work; except the cement steel reinforcement, and embedded parts which are specified to be paid for separately. No payment will be made for concrete, as such, which is placed in structures or in items for which payment is made as described below. Payment for expansion and contraction joint materials, waterstops and the pipe drains shall be included in the applicable contract prices for concrete. Bidding schedule items for concrete under this contract are as follows:

(1) Concrete outlet works inlet and outlet structures. - This item includes all concrete placed in this outlet works except as specified in subparagraph (2) below. Payment therefor will be made at the contract unit price per cubic yard for Item 27, "Concrete-Outlet Works-Inlet and Outlet Structures".

(2) Concrete-Outlet Works From Sta. 3 + 15.5 to Sta. 8 + 59.5. This item includes all concrete placed in the outlet works from Sta. 3 + 15.5 to Sta. 8 + 59.5. This item does not include the concrete pipe conduit. Payment therefor will be made at the contract unit price per cubic yard for Item 28, "Concrete-Outlet Works From Sta. 3 + 15.5 to Sta. 8 + 59.5".

(3) Concrete-Spillway Wall Lining, Retaining Wall, and Weir. - This item includes all concrete placed in the spillway including west and east walls and the weir. Payment therefor will be made at the contract unit price per cubic yard for Item 29, "Concrete-spillway-wall lining, Retaining wall, and weir."

b. Cement. - The quantity to be paid for under Item 30 "Cement" will be the number of barrels (376 pounds net weight) of cement used unless specifically excepted, wasted or used for the convenience of

the contractor. The quantity to be paid for will be determined by multiplying the theoretical batch weight of cement in each type of concrete used by the number of batches of concrete of the types placed within the pay lines of the structure, and dividing by 376. Payment shall be made at the contract price per barrel for the schedule item which price shall include the cost of required unloading, hauling, handling, and storage at the site, of all cement used in the work. No payment will be made for cement included under other items of work.

c. Reinforcement. - (1) Bars. - Unless otherwise specifically expected, measurement of reinforcing bars including dowels will be made on the basis of the lengths of bars placed in accordance with the approved drawings or bar schedules or as directed. The measured lengths will be converted to weights for the size of bars listed by the use of the unit weights per lineal foot stated in the applicable ASTM Specifications. Steel in laps indicated on the drawings or required by the Contracting Officer will be paid for at the contract unit price. No payment will be made for the additional steel in laps which are authorized for the convenience of the contractor. Furnishing and placing reinforcement bars including dowels will be paid for at the contract unit price per pound for Item No. 31, "Steel Reinforcement".

(2) No separate payment will be made for wire mesh reinforcement and all costs will be included in the applicable contract price.

d. Other Items. - (1) Payment for concrete, cement, and reinforcing steel used in the following items will be included under the applicable payment item for these items and no separate payment will be made therefor:

Description

Log Boom (Item 39)
Staff Gages (Item 40)
Bubble Gage Structure and Stairs (Item 36)
Concrete Pipe Conduit (Item 32)
Chain Link Fencing including Gates (Items 37 & 38)

(2) Payment for cement used in the following items will be included under the applicable payment items, and no separate payment will be made:

Hand cleaned bedrock surfaces-mortar for Foundation preparation (Item 11)
Anchor Bars (Items 25 and 26)

(3) Payment for cement used in grout under foundation drilling and grouting will be made under Item 24e, "Portland Cement in Grout".

SECTION 10

CONCRETE PIPE CONDUIT

(ITEM 32)
(Index)

SECTION 10

CONCRETE PIPE CONDUIT
(Item 32)

10-01. SCOPE. - This section covers construction of the 3' -0" diameter concrete pipe conduit, complete, including pipe supports.

10-02. APPLICABLE PUBLICATIONS. - The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

a. Federal Specification. -

SS-C-192d	Cements, Portland.

b. American Society for Testing and Materials Standards. -

A-15-58T	Billet Steel Bars for Concrete Reinforcement.
A-31-55	Boiler Rivet Steel and Rivets.
A-185-61T	Welded Steel Wire Fabric for Concrete Reinforcement.
A-283-58	Low and Intermediate Tensile Strength Carbon Steel Plates of Structural Quality (Plates 2 in. and Under in Thickness).
A-432-59T	Deformed Billet Steel Bars for Concrete Reinforcement with 60,000 psi Minimum Yield Point.
C-33-61T	Concrete Aggregates.
C-76-61T	Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
C-321-60	Air Content of Freshly Mixed Concrete by the Pressure Methods.
C-443-60T	Joints for Circular Concrete Sewer and Culvert Pipe, Using Flexible Watertight, Rubber-Type Gaskets.

c. Corps of Engineers. -

CRD-C13-55 Evaluation of Air-Entraining Admixtures for Concrete.

10-03. GENERAL. - Concrete pipe shall conform to the applicable requirements of ASTM Standard C-76, except as modified hereinafter. The pipe joint shall be sealed by a rubber gasket. Each length of pipe shall be provided with bell and spigot ends formed by steel joint rings securely fastened in the pipe wall. The spigot ring shall be lined with concrete on its interior surface and the bell ring shall be covered with concrete on its exterior surface. Portions of the joint rings which will be exposed after the pipe is manufactured shall be protected from corrosion by a metallic coating or equivalent applied by an approved method. The spigot ring shall have a groove for the purpose of receiving, holding and protecting the gasket. The steel for bell rings shall be 1/4 inch or more in thickness and shall conform to Grade A or B, ASTM Specification A-283. The steel for the spigot ends shall conform to Grade A, ASTM Specification A-31. The joint shall conform in all essential details with the rubber and steel joint for concrete pressure pipe as manufactured by Lock Joint Pipe Company. The pipe shall be cast vertically.

a. Strength Requirements. - (1) Compressive strength of concrete shall be not less than 5,000 psi at 28 days of age.

(2) Design load for pipe shall be 60 Kips per lineal foot from Sta. 3 + 15.5 to Sta. 3 + 95.5, 110 Kips per lineal foot from Sta. 3 + 95.5 to Sta. 7 + 15.5, and 60 Kips per lineal foot from Sta. 7 + 15.5 to Sta. 8 + 59.5. Not more than three lengths of pipe, selected at random, shall be tested by the three edge bearing method to determine the load to produce a 0.01 inch crack and for ultimate strength. The test load required to produce a 0.01 crack using a load factor of 3.0 shall be based on a factor of safety of not less than 1.33. The test load required to produce failure shall be based on a factor of safety of not less than 2.0 using a load factor of 3.0. The contractor shall furnish the extra lengths of pipe for testing without charge. Test methods shall conform to the applicable requirements of ASTM Specification C-76.

b. Responsibility and Certification. - All tests performed on the pipe shall be observed by a representative of the Contracting Officer. The Government reserves the right to observe and inspect all phases of the manufacture and testing of the pipe. The contractor shall be responsible for having the materials, concrete and pipe he proposes to furnish tested to demonstrate conformance to the applicable specifications. Certified copies of the test reports shall be delivered to the Contracting Officer before the pipe is installed.

10-04. MATERIALS. - The following materials shall conform to the respective specifications and the requirements specified below.

a. Concrete. - Concrete shall be composed of Portland cement, fine and coarse aggregate, water and an air-entraining admixture.

(1) Portland cement shall conform to Federal Specification SS-C-192, type II.

(2) Processed Aggregates. - Aggregates shall conform to ASTM Standard C33 except the grading requirements shall not apply.

(3) Air-entraining Admixture. - The air-entraining admixture shall be any approved substance or compound which will produce entrained air in the concrete. The air-entraining admixture shall conform to Corps of Engineers Serial No. CRD-C13 and will be accepted on manufacturer's certification of compliance. The air content by volume shall be 6.0 percent plus or minus 1.0 percent as determined by ASTM Standard C231.

(4) Water. - Water used in mixing and curing concrete shall be fresh, clean and suitable for use as drinking water.

b. Reinforcement. - Reinforcement steel shall conform to ASTM Standard A432, deformed, or ASTM Standard A15, hard grade, deformed. Welded wire fabric conforming to ASTM 185 will be acceptable. Reinforcing steel will be accepted on the basis of certified mill reports.

c. Rubber Gasket. - The gasket sealing the joint shall be made of rubber of special composition, having a texture to assure a watertight and permanent seal and shall be the product of a manufacturer having at least five years experience in the manufacture of rubber gaskets for pipe joints. The gasket shall be a continuous ring, of suitable cross section and of such size as to fill the groove on the spigot joint ring when the pipes are laid. The rubber gasket shall be the sole element depended upon to make the joint watertight and shall have smooth surfaces free from pitting, blisters, porosity and other imperfections.

10-05. INSTALLATION. - a. General. - The pipe shall be supported on chairs or other suitable means to substantially and uniformly support the pipe at the correct line and grade during placement of concrete. The pipe shall be anchored to prevent movement during placement of concrete. All pipe laying shall proceed from the intake transition with the tongue ends of tongue and groove pipe pointing upstream. Each pipe shall be laid true to line and grade and in such manner as to form a close joint with the adjoining pipe. As the work progresses, the interior of the pipe shall be cleared of all dirt, and superfluous materials of every description. At times when work is not in progress, open ends of pipe and fittings shall be securely and satisfactorily closed so that no water, earth or other substance will enter the pipe or fittings.

b. Jointing. - The pipe shall be jointed in accordance with the manufacturer's recommendations. In making the joints on the interior of the pipe, special care shall be taken to assure a smooth surface with no projections or depressions.

c. Concrete. - After pipe has been installed, inspected and approved by the Contracting Officer, concrete shall be placed and compacted with vibration equipment to the indicated limits as specified under Section 9, CONCRETE.

10-06. PAYMENT. - Payment for all work specified in this section except as specified below, will be made at the lump sum price for Item No. 32, "Pipe Conduit". Concrete and cement in connection with the concrete placed under or around the pipe will be paid for separately under the applicable payment items.

SECTION 11

BUBBLE GAGE SHELTER

(INDEX)

SECTION 11

BUBBLE GAGE SHELTER

(Item 36)

11-01. SCOPE. - This section covers the Bubble Gage Shelter, complete, including concrete stairs and pipe railings.

11-02. DRAWINGS FOR APPROVAL. - Before furnishing door, including threshold and weatherstripping for door bottom, detailed shop drawings supplemented by descriptive data and hardware schedule, shall be submitted for approval.

11-03. EXCAVATION AND BACKFILLING. - a. General. - All work shall be executed to the lines and grades shown on the drawings or approved by the Contracting Officer.

b. Excavation. - Except as otherwise specified in Section 6, ROCK FILL, ROCK SLOPE PROTECTION, GRAVEL BEDDING AND ROAD GRAVEL, the dam embankment shall be completed prior to excavation required for the construction of the Bubble Gage Shelter. Excavation required for construction of the Bubble Gage Shelter shall not proceed until directed by the Contracting Officer. Excavation shall conform to the dimensions and elevations shown on the drawings. Where the excavation is made below the elevations indicated on the drawings or directed, the depths of the walls shall be increased, as may be directed. Excavation shall generally extend 24 inches outside the walls to allow for placing and removal of forms, installation of bubble gage conduit, floor drain pipe, and for inspection. Undercutting will not be permitted.

c. Bubble Gage Shelter Fill. - Bubble Gage Shelter fill shall consist of material conforming to the requirements for gravel fill as stated in SECTION 5, EMBANKMENTS. Prior to the placement of Bubble Gage Shelter fill, foundation walls shall be completed, all forms shall be removed, and the foundation areas for the fill shall be cleared of all trash and debris. Bubble Gage Shelter fill to be placed in the areas beneath the stairways and roadway on top of embankment and in areas contiguous thereto for a horizontal distance of 3 feet shall be placed and compacted as specified for gravel backfill in SECTION 5, EMBANKMENTS. All other Bubble Gage Shelter fill shall be placed in 12-inch layers without compaction other than that incidental to construction operations. Bubble Gage Shelter fill shall not be placed adjacent to the Bubble Gage Shelter until at least 14 days after its completion. Extreme care shall be exercised during the placement of Bubble Gage Shelter fill to prevent damage to bubble gage conduit, floor drain discharge piping, or to the Bubble Gage Shelter.

d. Rock Fill, Rock Slope Protection and Gravel Bedding. - Rock fill, rock slope protection and gravel bedding to be placed as a

result of the construction of the Bubble Gage Shelter, bubble gage conduit, and the discharge piping shall meet all requirements of SECTION 6, ROCK FILL, ROCK SLOPE PROTECTION, GRAVEL BEDDING AND ROAD GRAVEL, except as otherwise specified herein. The rock slope protection material and gravel bedding shall not be placed adjacent to the Bubble Gage Shelter until at least 14 days after its completion. Rock fill, rock slope protection and gravel bedding material to be placed in the trench provided for the bubble gage conduit and in other limited areas shall be placed by hand. Extreme care shall be exercised during the placement of rock fill, gravel bedding, and rock slope protection materials to prevent damage to the bubble gage conduit, discharge piping or to the Bubble Gage Shelter. Rock slope protection and gravel bedding material shall be placed in the trench as directed; see Special Conditions.

11-04. CONCRETE. - All concrete work required for the building shall conform with the applicable requirements of SECTION 9, CONCRETE.

11-05. GLASS BLOCK MASONRY. - a. Materials. - (1) Asphalt emulsion shall be of the type of manufacture recommended by the manufacturer of the glass block to be used and as approved by the Contracting Officer.

(2) Calking compound shall be of gun consistency, of color approved by the Contracting Officer, and of the type and manufacture recommended by the manufacturer of the glass block to be used.

(3) Glass block units shall be hollow, partially evacuated, and constructed of water, clear pressed glass, formed of two halves fused together at a high temperature. The exposed faces shall be 11-3/4-inches square and the blocks 3-7/8-inches thick. The mortar-bearing surfaces shall be precoated with grit bearing, water-and alkali-resisting materials. The design or pattern designation of the blocks shall be similar to "Decora", as manufactured by Pittsburgh Corning.

(4) Mortar shall be composed of 1 part portland cement, 1 part hydrated lime (min) and 4 parts sand (max). Based upon recommendations of the glass-block manufacturer an approved integral water-proofing admixture may be used. Mortar shall be mixed as recommended by manufacturer.

(5) Oakum shall be a commercially manufactured, nonstaining type, treated to prevent mildew and dry rot and approved by the Contracting Officer.

(6) Angles. - Structural steel angles shall be securely anchored to concrete using bolts.

b. Installation. - (1) General. - Wood wedges may be used to aline the interior and exterior surfaces. The wedges shall be withdrawn after the mortar has set sufficiently, so that the calking of the exterior

spaces between the lateral surfaces of the glass block and sills, jambs and head of openings will be continuous.

(2) Setting and Anchorage. - The sill under glass-block panels shall be coated with a layer of asphalt emulsion not less than 1/16-inch thick or covered with a layer of 15 pound asphalt saturated roofing felt. The coating shall be allowed to dry thoroughly, but not less than 1 hour, before being covered with the mortar bed.

(3) Joints. - The visible surface of all mortar joints shall be not more than 1/4-inch nor less than 3/16-inch wide. Vertical joints shall be completely filled with mortar. While the mortar is still plastic, the joints shall be raked back a sufficient depth to expose the edges of the block as sharp clear lines. Immediately following the operation, the joints shall be tooled slightly concave and smooth. The recesses left between the face of the glass-block panel and the head of openings shall be rammed full with oakum to within 5/8-inch of the exposed surface of the glass block. The recess grooves thus left in front of the oakum shall then be calked full on both interior and exterior to provide a fully watertight and weatherproof joint.

c. Cleaning. - While the mortar is still plastic, all mortar and foreign material shall be removed from the faces of the blocks. Upon completion of the glass-block work and after the mortar has attained its final set, any pits or depressions in the mortar joints on both exterior and interior surfaces of the work shall be suitably roughened and pointed full with the surface of joints tooled smooth to match the adjoining work. All mortar daubs and splashes shall be removed from the finished surfaces of the block and surrounding finished work.

d. Wire Mesh Guard. - The contractor shall furnish and install a wire mesh guard over the glass blocks. Mesh shall be welded to the steel angles. Mesh shall be fabricated of No. 12 gauge steel wire, woven into 1-inch diamond mesh.

11-06. MISCELLANEOUS METALS. - a. Metal Threshold. - The door threshold shall be an interlocking weatherstrip type threshold, 5-1/2" x 5/8", shall be fabricated from non-ferrous metal with a non-slip top surface, shall be bedded in calking compound, and shall be anchored to the concrete by means of bolts set in expansion sleeves.

b. Weatherstripping. - Materials in connection with weatherstripping for door bottom shall be No. 9 gauge standard sheet (not ribbon) zinc, cut across the grain. Weatherstripping shall not react against type of threshold furnished.

c. Channel Frame. - Frame for door shall be structural steel channel. Stop shall be of structural steel bar stock plug welded to

channel jambs and head. Frame shall be provided with four anchors to each jamb. Frame shall be notched as required to receive hardware.

d. Floor Drain. - The contractor shall furnish and install a floor drain and discharge piping. Discharge piping shall extend into rock fill. All applicable requirements relative to installation of gage conduit as specified in Paragraph 11-11 shall apply to installation of discharge piping. Discharge pipe shall conform to Federal Specification SS-P-356, 4-inch. Floor drain shall conform to Federal Specification WW-P-541b, type 224, 4-inch pipe discharge.

11-07. PIPE RAILINGS. - All pipe railing at Bubble Gage Shelter, including railing along stairs, shall be standard weight mild steel pipe conforming to Federal Specification WW-P-404c. Pipe shall be 1-1/2-inch standard weight. Shop drawings shall be submitted. All pipe shall be hot dip galvanized after manufacture.

a. Fabricated. - Jointing of post rail and corners shall be by mitered and welded type joints.

(1) Mitered and welded type joints shall be made by fitting post to top rail and intermediate rail to post, mitering corners, grooving welding joints and grinding smooth. Railing splices shall be butted and reinforced by a tight-fitting interior sleeve not less than 6 inches long.

(2) Railings may be bent at corners in lieu of mitering and welding or by using fittings, provided all such bends are made in suitable jigs and that the cylindrical cross section of the pipe be maintained through the entire bending.

b. Anchorage. - Posts shall be set into 6-inch sleeve inserts set and anchored in the concrete. Posts shall be inserted in sleeves, leveled, plumbed and calked with molten lead or lead wool and anchorage joint shall be covered with pipe collar pinned to post. Ends of rails shall be secured by means of standard steel pipe flanges anchored to concrete with expansion bolts.

11-08. STEEL LADDER. - Steel ladder shall be of the bar and rung type, constructed of structural steel in accordance with the details and the following minimum requirements. Stringers shall be a minimum 3/8-inch by 2-1/2-inch mild steel bars fitted with plates for securing to concrete. Rungs shall be 3/4-inch minimum round, solid section steel rods, fitted into punched holes in stringers, welded and ground smooth. Ladder shall be secured at each end. Grab bar shall be a galvanized pipe grab bar and shall be installed where indicated.

11-09. METAL GRATINGS AND FRAMES. - Metal gratings shall conform to the requirements of Federal Specification RR-G-661a, Type I. Edges of all gratings shall be banded, and all gratings shall be hot dip galvanized. Frames shall be of standard steel angles and shall be all-welded construction, and galvanized to match gratings. Frames shall be provided with welded-on anchors. Shop drawings shall be submitted.

11-10. HOLLOW METAL DOOR. - a. General. - The contractor shall furnish all material and hardware for, and install complete, the entrance door as indicated on the drawings. Door shall be provided with two insect screened weatherproof louvers. Screens shall have non-ferrous screen cloth and shall be provided with rewireable frame.

b. Material. - All material shall be of the best grade open hearth, cold-rolled, full-pickled, annealed and reannealed patent leveled furniture ingot iron. Gages referred to are all U. S. Standard and are the minimum acceptable for this work. Door shall be of the flush type hollow metal construction, 1-3/4-inches thick and of 16-gage stock. Top and bottom of door shall have stiffener channels welded to side plates, and shall be reinforced by formed steel, Z-bar sections extending full height and spaced not over 6 inches on centers. Sound-deadening cork board strips shall completely fill each space. Exposed welds shall be ground to true, even plane with no grinding marks visible. Door shall be free from warps, dents or buckles. Door shall be properly reinforced for hardware and shall be drilled and tapped for application of hardware. Backing for hardware shall be not less than 1/8-inch thick and heavier where necessary to develop full strength of machine screws. Door shall be mortised for butts and reinforcement provided by door manufacturer. Joints and miters shall be welded full length of hair line joints. Fourteen-gage reinforcements shall be provided for lock and lock strike. All reinforcement shall be securely welded in place. Mortises shall be neat and carefully fitted to hardware items. Any voids between metals and all mortises where hinges pass through rebates shall be filled with metal, welded in place.

c. Painting. - The door shall be shop painted in accordance with the standard practice of the manufacturer. The door before assembling shall be cleaned and primed with one coat of approved rust-resistant paint baked on, followed by one coat of mineral filler baked on and rubbed. The door shall be finish ' painted as hereinafter specified in SECTION 16, PAINTING

d. Hardware. - The door shall open from the left and shall have 1-1/2 pairs of butts and a lockset, as follows:

*Butts - 1-1/2 pair, Type T-2147 USP, 4-1/2" x 4-1/2" (non-rising, non-removable pins when door is closed) (weld jamb leaf). (Federal Specification FF-H-116c).

Lock, Type 86EW-5S. (Federal Specification FF-H-106a).

*Oilite bearing butts may be furnished at contractor's option.

11-11. GAGE CONDUIT. - The gage conduit shall be placed in a single continuous operation after the embankment has been fully completed and when directed (see Special Conditions) except as otherwise specified in Section 6, ROCK FILL, ROCK SLOPE PROTECTION, GRAVEL BEDDING AND ROAD GRAVEL. Placement of the gage conduit shall not proceed until approved by the Contracting Officer. The contractor shall furnish and install under this section, the pipe conduit for the gage recording system. Conduit including fittings and bends, shall conform to Federal Specification WW-P-406a, Weight A, Class 2. Pipe shall be provided with taper-threaded ends and joined by zinc-coated couplings. The joints shall provide a watertight joint. The contractor shall delay placing gravel bedding, rock fill and rock slope protection materials in locations where conduit is to be placed until conduit has been placed. Care shall be exercised in placing fills in the vicinity of the conduit in order to avoid damage to pipe including galvanized treatment. The interior of the conduit shall be free from obstructions. The contractor shall install a No. 10 pulling wire in the conduit.

a. Gage Inlet. - The gage inlet shall be as indicated. Corrosion resisting bolts shall conform to Federal Specification FF-B-575b. Washers of corrosion-resisting steel shall be provided with required thickness if flange holes are enlarged or slotted for adjustment during installation. Steel plate shall conform to ASTM A36-60T. Cap shall conform to Federal Specification WW-P-521d, Type I. Nipple shall conform to Federal Specification WW-N-351a, and shall be of wrought iron. The 2" x 9" eccentric flange may be fabricated in field from blind cast iron flange, Crane or equal. Thread of nipple shall accommodate cap and flange. Anchors shall be set by template. Gage shall be painted as specified in Section 16.

11-12. WOOD SHELF. - Shelving including supports and nailers of indicated thickness shall be free from knotholes, loose or unsound knots, wane, decay, and splits longer than the width of the piece. Shelving, including supports, etc., shall be pressure treated in accordance with Federal Specification TT-W-571g.

11-13. BRONZE PLAQUE. - a. General. - The contractor shall furnish and install a bronze plaque as hereinafter specified.

b. Materials. - (1) Bronze casting shall conform to Federal Specification QQ-L-225, composition standard with manufacturer.

(2) Other items shall conform to the current standard practice for material required and use intended.

c. Construction. - The size and thickness of the plaque are indicated. The plaque border shall be raised and the edge shall be beveled. Both the raised border and the beveled edge shall be polished a bright finish. The plaque background shall have a sunken, matte surface with a statuary bronze finish. The letters shall be hand tooled, flat

faced and polished to a bright finish. The plaque shall be furnished with four expansion bolts for securing to wall and with four rosettes.

11-14. PAYMENT. - Payment for all work specified in this section including cement, reinforcement and concrete, conduit and inlet for gage, plaque, railings, excavation, Bubble Gage Shelter fill, discharge piping, and painting and all costs in connection therewith shall be included in the lump-sum contract price for Item 36, "Bubble Gage Shelter".

SECTION 12

SLUICE GATES AND ACCESSORIES
(Items 33 and 34)
(Index)

SECTION 12

SLUICE GATES AND ACCESSORIES
(Items 33 and 34)

12-01. SCOPE. - a. This section covers designing and installing gates, with frames, guides, stems, hoists, conduit linings and accessories, complete.

b. Any item or part necessary for satisfactory operation of the gates and accessories shall be installed by the contractor whether or not such part or item is shown on the drawings or mentioned in the specifications.

12-02. DESCRIPTION. - a. The gate leaves, gate frames and guides shall be constructed of cast iron conforming to Federal Specification QQ-I-652a, not less than class 30. The gates shall be rectangular in shape and provided with seals to make them watertight within practicable limits when closed. The gates and appurtenant parts shall be the product of a reliable manufacturer who can show at least 5 years of successful experience in the manufacture of similar gates.

b. The gates shall be operated by hand operated screw hoists as indicated on the drawings.

12-03. DESIGN. - a. General. - The contractor shall design the gates with their frames, guides, stems, and hoists. Gates and hoists shall be designed for the static heads indicated on the drawings. The opening and closing forces shall be based on a coefficient of friction of 0.6 on the gate and shall include allowances for the weight of the gate and gate stem. Streamlining features of the gate leaves, frames, and conduit lining indicated on the drawings shall be incorporated into the design. The gate stem, gate leaf and gate hoist support shall be designed to withstand both opening and closing forces produced by the pull of 40 pounds on the gate hoist hand crank with resultant stresses not in excess of the 75 percent yield point of the material involved.

b. Design Stresses. - (1) Cast Iron. - A factor of safety of fifteen shall be used for castings subject to severe shock or vibration, a factor of safety of ten shall be used for castings subject to mild shock, and a factor of safety of six shall be used for all other castings. Gate leaves, frames, and frame extensions shall be considered to be subject to severe shock, and hoist pedestals shall be considered to be subject to mild shock.

(2) Unit stresses in other materials shall be in accordance with the best current engineering practice, but in no event shall the unit stress exceed 20 percent of the specified minimum ultimate strength of the material to be used.

c. Computation of Stresses. - (1) Computation of stresses shall take into account all dead and live loads, including allowances for impact, acceleration, and decleration.

(2) Gate Stems. - The gate stems shall be designed as a short column with an l/r not greater than 120. The minimum allowable unit stress in the gate stem in compression shall be determined from the column formula for main members on page 207 of the latest edition of the Steel Construction Manual by the American Institute of Steel Construction.

12-04. DRAWINGS. - a. The drawings show certain required and limiting dimensions and other general requirements for the construction and operation of the gates and hoists, but are not to be taken as defining the detailed design of the gates, hoists, and appurtenances.

b. The contractor shall submit assembly and detailed drawings and other information to demonstrate fully that all parts of the equipment will conform to the requirement and intent of the specifications. The information shall be submitted in conformance with the requirements of paragraph SC-4 and shall include the following.

(1) Design computations of the hoists, gates and gate stems.

(2) Shop drawings of all parts except parts of components which are of standard manufacture.

(3) Manufacturer's assembly drawings or cuts and catalog data of parts or components of standard manufacture showing sizes, ratings, overall dimensions and mounting dimensions.

12-05. MATERIALS. - All materials used in the construction of the equipment shall be the best available for the purpose, considering strength, durability, and the best engineering practice. Unless otherwise specified, all materials shall conform to the requirements of the latest applicable Federal Specification, or in case there are no applicable Federal Specifications, to applicable specifications of the American Society for Testing Materials. Metal and miscellaneous material shall conform to the requirements indicated on the drawings or referred to in these specifications and when not covered thereby, metals and materials of standard quality shall be furnished. Materials shall be of the classification and grades approved by the Contracting Officer. Products other than those specified herein may be accepted when it is proved to the satisfaction of the Contracting Officer that they are equal in strength, durability, usefulness, and convenience for the purpose intended. In case the contractor desires to use stock material not manufactured specifically for the work covered by these specifications, he shall submit evidence satisfactory to the Contracting Officer that such material conforms to the requirements of the

specifications, in which case detailed tests of these materials may be waived. Whenever requested to do so, the contractor shall submit to the Contracting Officer two certified copies of tests of all materials he proposes to use in the manufacture of the equipment. The results of these tests shall be in such form as to afford means of determining compliance with the applicable specifications for the materials tested. The cost of making all the above required tests shall be borne by the contractor. The Contracting Officer shall have the right to select, test and analyze, at the expense of the Government, additional test specimens of any or all of materials to be used. The results of such tests and analyses shall be considered of equal value to the tests made by the contractor to determine compliance with the applicable specifications for the material used.

12-06. WORKMANSHIP. - a. General. - All work shall be done and completed in a thorough workmanlike manner, and shall follow the best modern practice in the manufacture of high grade machinery, notwithstanding any omission from the specifications and drawings. All work shall be done by mechanics skilled in their various trades, and whenever possible all parts shall be made accurately to standard gage to facilitate replacement and repair.

b. Tolerances. - Tolerances and clearances specified on the drawings shall be closely adhered to and the machine work shall in all cases be of high grade workmanship and finish, carefully performed to the satisfaction of the Contracting Officer. Where tolerances or fits are not specified on the drawings, the contractor shall follow the best modern shop practice for equipment of the type covered by these specifications, due consideration being given to the special nature or function of the parts and to the corresponding accuracy required to secure proper operation.

c. Machine Finish. - (1) The type of machine finish, where not otherwise specified, shall be that most suitable for the part to which it applies. Surfaces shall be machine finished wherever an "f" or other mark denoting machine finish appears on the drawings, and on all other surfaces where necessary to insure proper fitting together of parts. Welding, plugging, or shimming to correct defects of material or workmanship will be permitted only where such defects do not affect the strength or interfere with the correct functioning of the part.

(2) So far as practicable, all work shall be laid out to secure good matching of adjoining unfinished surfaces. Any discrepancy between adjoining unfinished surfaces shall be corrected by chipping, grinding or machining to secure proper alignment. Unfinished surfaces shall be true to the lines and dimensions shown on the drawings, and shall be chipped or ground free of wall projections or rough spots.

12-07. GATES AND GATE STEMS. - a. The gates shall be of the pressure seating type as indicated on the drawings. Each gate leaf shall consist of a rectangular plate with horizontal and vertical ribs. The 36" x 24" gate shall be provided with side wedges. The bottom edge of the 36" x 36" gate shall be for bottom seating and streamlined as shown on the drawings, so that the gate may be operated in part open position without serious vibration. Wedges shall be bronze with bronze adjusting bolts.

b. Seal Strips. - (1) 36" x 36" Gate. - The seal strips of the gate leaf shall be constructed of bronze conforming to Federal Specification QQ-L-225, Composition 6. The seal strips shall be machined to a snug fit with their bearing seats to provide watertight joints between seal strips and their respective bearing seats.

(2) Each bearing seat shall be coated with a thin coat of white lead paste mixed in linseed oil, immediately after which the seal strips shall be assembled on their bearing seats in the casting and the seal screws held in place by lock pins or other approved means to prevent loosening. The seal screws shall be of the same material as the respective seal strips. The seal screws should be provided with a special twist-off head for tightening. The special head shall project beyond the regular countersunk head and shall be designed to shear off when the screw is tight. After attaching the seal strips, the sliding surfaces shall be machined to a true plane.

(3) 36" x 24" Gate. - The gate frame and gate leaf shall have machine finished grooves into which the bronze seal strips shall be pressed and securely anchored in place. The bronze seal strips shall be machined to a true surface after installation on both the gate frame and gate leaf.

c. Gate Leaf. - (1) The leaf for 36" x 36" gate shall have an integrally cast procket in the center of the leaf near the top. The pocket shall be reinforced by ribs and shall be fitted for a solid maganese bronze thrust nut. The thrust nut shall be threaded and keyed to the gate stem and shall be designed to withstand the imposed thrust of the gate stem.

(2) The leaf for the 36" x 24" gate shall have nut fastened to the top in such a position that the bottom of the stem is always above the waterway. This nut shall be threaded out to engage with the threads on the stem and shall be prevented from turning. Holes shall be cored in the horizontal ribs of the leaf of sufficient diameter to allow the leaf to pass up over the stem, without interference.

d. Each gate shall be provided with a stem capable of withstanding the maximum thrust of the hoist at 40 pounds pull on the crank. The gate stem shall be made of rolled bronze stock conforming to Federal Specification QQ-B-728, Class A, half hard or ASTM B 98-58, Alloy A. The

gate stem shall be of a length to suit the hoist, and shall be furnished in sections of a length to suit the stem guide locations shown on the drawings. The sections of each stem shall be jointed together by solid manganese bronze couplings threaded and keyed to the stems. Each stem shall be provided with stem guides located as shown on the drawings. All stem guides shall be bronze bushed and adjustable. The bronze bushings in the stem guides shall be securely locked into the guide.

12-08. GATE FRAMES AND GUIDES. - The gate frames shall be cast iron of the design indicated on the drawings and shall have the surfaces machined and drilled to attach to the conduit linings or wall thimble and the front faces machined to take the gate guides and seal strips. Seal strips constructed of bronze shall be attached to the gate frame and frame extension as indicated on the drawing and specified in Paragraph 12-07b for the gate leaf. Frame seal strips for the 36" x 36" gates shall be of the following composition:

	Percent
Copper	82-83
Tin	6.75-7.5
Lead	4.5-5.0
Zinc	5.0-6.0

The gate frames for the flush bottom gate shall be provided with a Babbitt lined bottom seal to provide a seating face flush with the conduit floor to match with the seating face on the bottom of the gate leaf. Babbitt shall conform to Federal Specification QQ-T-390, Grade 3. The bottom seal frame shall be bolted to the gate frame. The guides shall be of cast iron, of heavy sections reinforced with ribs as necessary. The guides shall be of sufficient length to permit the gage leaf to be fully within the guide when the gate is in the full open position. Bronze bolts, conforming to Federal Specification QQ-B-728, Class A, half hard, shall be used to fasten the guides to the gate frame and for seal bolts. All anchor bolts and nuts shall be of stainless steel conforming to Federal Specification QQ-S-763b, Class 304 or 316.

12-09. HAND-OPERATED HOISTS. - a. The hand-operated hoists shall be floorstand type with pedestal and gear case of cast iron or steel. The entire unit shall be designed for infrequent submersion without damage to the operating parts. The required pull on the handwheel or crank to open or close the gate should not exceed 40 pounds. The hoist shall be fitted with a bronze operating nut, antifriction bearings of ample capacity to carry the thrust load on the nut and other gearing. Gears shall be made of steel with machine cut teeth. Suitable provision shall be made for manual lubrication of all bearings. The operating nut on the non-rising stem gate shall be keyed to the stem. Gear case shall be provided with neoprene gaskets and shall be filled with grease at the factory.

b. Torque Plate. - The floor stand for rising stem gate shall be mounted on a torque plate to prevent stem twist mounting. Bolts of ample size shall be provided to attach the torque plate and floor stand and to anchor the torque plate to the foundation.

c. Stem Cover. - The rising stem shall be protected by a cylindrical cover with a cap and flange for attaching to the top of the floor stand. Stem cover shall have graduated scale and an indicator shall be attached to the top of the stem to show gate position.

d. A suitable gate position indicator, in addition to the indicator on the rising stem, shall be provided and mounted on each floor stand in such a manner that the operator can observe the position of the gate at all times.

12-10. CONDUIT LINING. - The cast iron conduit linings conforming to Federal Specification QQ-I-652a, Class 30, shall be furnished as indicated on the drawings.

12-11. WALL THIMBLE. - a. The wall thimble shall be cast iron, conforming to Federal Specification QQ-I-652a, Class 30, twelve-inch depth, "F" type, with a machine finished face for contact with the gate frame. The thimble shall be equipped with bronze studs and bronze nuts for attaching the gate.

12-12. PAINTING. - Painting shall conform to the requirements of Section, PAINTING.

12-13. INSTALLATION. - The gates, gate hoist and accessories, including conduit linings or wall thimble, shall be assembled and installed complete as indicated on the drawings, under the supervision of a representative of the gate manufacturer, and as directed. The gate frame guides and the conduit linings shall be assembled in place and bolted together. The gate leaf shall be placed in the assembled frames and the guides securely bolted to them. The assembled units shall then be checked for alignment and elevation, and the structures shall be substantially anchored in place. After the form work is completed at the ends of the conduit linings, the concrete shall be carefully placed around the frames specified. All bolts, special tools, marks and other devices necessary to erect the gates and linings, and any special anchors required to secure the assembled parts while they are being concreted in place, shall be furnished with the gates. The gate hoists shall be installed in correct alignment with the gates. The gate stems shall be coated with grease with a soap base or other approved compound for protection against corrosion. The gate position indicators shall be accurately adjusted at the time of installation.

12-14. INSPECTION AND TESTS. - a. The gates and accessories shall be assembled in the shop as directed for inspection and to insure that all parts fit accurately and are in proper alignment. Each gate shall be opened and closed to insure proper operation.

b. After completion of the gate structures and the installation of all machinery, each gate shall be tested under the supervision of gate manufacturer's representative for satisfactory operation by being raised and lowered at least three times for its full length of travel. Any adjustment in the setting or installation required to secure satisfactory operations and tight closure of the gates shall be made by the contractor.

12-15. GUARANTEE. - The gates and accessories to be furnished under this section of the specifications shall be guaranteed in accordance with the guarantee provisions of the SPECIAL CONDITIONS.

12-16. TOOLS AND OPERATING INSTRUCTIONS. - The contractor shall furnish a complete set of all special tools needed for the adjustment operation and maintenance of the gates and accessories; five complete bound lists of parts with necessary illustrations and references to permit convenient ordering of repair parts; and five bound complete, clear and concise sets of instructions for the operation, adjustment, lubrication and maintenance of the gates and accessories furnished under this section.

12-17. PAYMENT. - a. Payment for designing, furnishing and installing the gates, guides, frames, stems and hoists, and conduit linings will be made at the applicable contract prices for Item No. 33, "Sluice Gate - 2' x 3' " and Item No. 34, "Sluice Gate - 3' x 3' ". Payments shall include all necessary accessories not included under any other item and all costs of furnishing the services of a representative of the gate manufacturer.

b. Partial payment up to 70 percent of the contract price for each item but not exceeding the manufacturer's price to the contractor will be made when the equipment has been satisfactorily shop tested and delivered complete at the site of the work.

c. Final payment of the contract prices will be made after the field tests are satisfactorily completed in accordance with Paragraph 12-14.

d. Payment for testing shall be included in the contract prices for "Sluice Gates".

SECTION 13

AIR VENT
(Item 35)
(Item 36)

SECTION 13

AIR VENT
(Item 55)

13-01. SCOPE. - This section covers the air vent, complete, including structural steel transition lining section.

13-02. GENERAL. - The contractor shall install the air vent and accessories complete as shown on drawings. Transition lining section shall be of welded construction and shall be supported and braced as required during concreting operations. The vent transition lining section shall be painted as specified in painting section for surfaces subject to immersion in water. Cast iron fittings will not require any painting.

13-03. MATERIALS. - a. Cement-Asbestos Pipe. - Cement-asbestos pipe shall conform to the requirements of Federal Specification SS-P-351a, Class 150.

b. Fittings. - Fittings shall be cast iron bell and spigot type and shall comply with American Water Works Association specifications for Class 150 pipe. Connections between cement-asbestos pipe and cast iron fittings shall be made with lead jointing material or with other materials recommended by pipe manufacturer and approved by the Contracting Officer.

c. Structural Steel. - Structural steel for transition lining section and steel strap supports shall conform to ASTM Designation A36-61T.

d. Screen. - The air vent screen cloth shall be mounted as a sturdy rewireable frame. The frame shall be secured to air vent outlet cast iron elbow with cap screws. The elbow shall be drilled and tapped to receive the screws. Cloth for screen shall conform to Federal Specification RR-C-440, Type I, Class I, 1/2" mesh, 12 gage wire (.105 inch). Both frame and cloth shall be galvanized.

13-04. INSTALLATION. - a. Except as specified in Section 6, "ROCK FILL, ROCK SLOPE PROTECTION, GRAVEL BEDDING", the dam embankment shall be completed prior to the installation of the air vent. Rock fill, rock slope protection and gravel bedding to be placed in the trench for the air vent shall meet all requirements of Section 6. Bubble gage shelter fill to be placed after installation of air vent shall meet requirements of Section 11, "BUBBLE GAGE SHELTER".

b. A temporary plug shall be provided to close off the vent opening until balance can be installed. Except as provided in Section 6, the final section of air vent piping shall be placed in a single operation after embankment is completed.

13-05. PAYMENT. - Payment will be made at the contract lump sum price for Item No. 35, "Air Vent" which price shall include all work specified in this section, (except excavation, backfill, gravel bedding and slope protection), including the installation of the complete air vent system including air intake connections at gate frame, transition lining section, pipe supports, cement-asbestos pipe, cast iron pipe fittings, air vent screen and frame, transition, vent grille, and all fittings, anchors, supports, and incidentals thereto. Excavation and fills and backfills of hand placed gravel bedding, bubble gage shelter fill, rock fill, and rock slope protection are included under Item No. 36 "Bubble Gage Shelter".

SECTION 14

MISCELLANEOUS ITEMS OF WORK
(Items 37 thru 41, & 43)
(Index)

SECTION 14

MISCELLANEOUS ITEMS OF WORK
(Items 37 thru 41, & 43)

14-01. SCOPE. - The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances, and materials, and in performing all operations in connection with miscellaneous work items listed below, complete, in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and conditions of the contract.

14-02. CHAIN LINK FENCING. - a. General. - Chain link fencing, and gates, four feet in height, shall be installed where and as shown on the drawings. Fencing shall be braced at changes in directions and at ends, in accordance with manufacturer's recommendations.

b. Material and Description. - (1) Posts shall be galvanized and shall be in accordance with Federal Specification RR-F-183. Line posts shall be 2" O.D. tubular steel pipe weighing at least 2.7 lbs. per lin. ft. End, corner, and angle posts shall be 2-1/2 inch O.D. tubular steel pipe weighing at least 3.63 pounds per linear foot. Gate posts shall be 4" O.D. tubular steel pipe weighing at least 9.11 pounds per linear foot. The line posts shall be spaced not more than 10 feet on centers and embedded in the manner and depth shown on the drawings. All posts shall have an ornamental ball top.

(2) The fencing fabric shall conform to the requirements of Federal Specification RR-F-191a, Type A. The fabric shall be made of 2 inch diamond mesh (4 foot high) chain link, galvanized steel wire fencing, No. 9 gage. The fencing shall be set to line and grade as shown on the drawings or as directed. Top edge of the fabric shall have a knuckled finish and bottom edge shall have a twisted finish. The fence shall have top rail not less than 1-5/8 inches (2.28 pounds per linear foot) nominal outside diameter, galvanized, tubular steel pipe. Tension wire along bottom of fencing fabric shall be zinc coated No. 6 or 7 coil spring wire.

(3) Aluminum fabric ties of suitable gage shall be provided for attaching the wire mesh to the posts and top rail.

(4) Gates shall be constructed with malleable iron fittings securely braced and trussed up with welded connections. Gates shall be filled with fabric to match fencing. Gates shall be equipped with pivot type malleable iron hinges, padlock, keepers, gate shoe and stops. Gates shall be equipped for locking at the top, middle, and bottom with the middle lock arranged for padlocking. Padlock with chain and three keys (and conforming to Federal Specification FF-P-101c, Type EPC, size 2-inch)

shall be provided for each set of gates. All padlocks shall be keyed alike.

(5) A sign shall be mounted on each gate leaf. The signs shall be made of galvanized sheet steel (12 gage) properly reinforced. All surfaces shall be primed and then finished with two coats of exterior white paint. Lettering shall be done by a sign painter using a reflectorized type of paint.

(6) The fencing shall be constructed and installed as herein specified and in accordance with the best methods for workmanship adopted for this type of work in accordance with manufacturers' instructions and shall be pursued to a satisfactory completion as approved by the Contracting Officer.

c. Payment. - Payment for furnishing and installing chain link fencing will be made at the contract unit price per lineal foot for Item 37, "Chain Link Fencing", measured along the fence line between the end posts. Payment for furnishing and installing each set of double gates complete with signs, will be made at the contract unit price each for Item 38, "Gates, Double, Chain Link". The contract prices shall include all costs in connection with earth and rock excavation, concrete foundations, and grouting sockets.

14-03. LOG BOOM. - a. General. - The contractor shall furnish, construct, and erect a log boom at the location upstream of the dam as indicated on the drawings. Concrete shall conform to the requirements of Section 9.

b. Materials. - (1) Boom logs shall be white pine or spruce having a minimum diameter of 10 inches at the tip and shall be furnished in 18-foot to 20-foot lengths except the maximum length shall be reduced to follow final finish grade, permanent pool elevation, and existing contours, and to avoid abrupt changes. Logs shall be sound, straight, free from rot, and shall be approved prior to use. To the extent such logs are available the contractor shall use logs obtained in the course of clearing operations. Steel for the anchors shall conform to Federal Specification QQ-S-741a.

(2) Boom and auxiliary cable shall be new 3/4-inch galvanized wire rope 3-strand, 7 wires to the strand, conforming to the requirements of Federal Specification RR-W-420, preformed.

(3) Boom chains shall be fabricated from 1/2-inch galvanized stock, approximately 5-1/2 feet long, overall similar and approved equal to American Chain Co., Type B. The rings and toggles shall meet the same specifications as for the boom chains.

c. Construction. - A hole approximately 2-1/4-inch in diameter shall be bored through each end of the log. The logs shall be connected end to end by passing the boom chains through the bored holes and the whole assembly reinforced by threading the 3/4-inch wire rope through the rings of the boom chains. The ends of the cable shall be anchored as shown on the drawings. Anchors shall be installed in drilled holes and grouted in place using grout as specified in Paragraph 8-04.

d. Payment. - Payment for the log boom complete as specified will be made at the contract lump sum price for Item 39, "Log Boom", and shall include all costs in connection therewith, including all metallic items, painting, end anchorages, drilling, grouting, concrete and cement.

14-04. STAFF GAGES. - a. General. - The staff gages shall be installed at the locations indicated on the drawings and in accordance with the design and dimensions shown on the drawings. All excavation and backfill shall be performed and included under this paragraph.

b. Construction. - Staff gages shall be erected to the sizes and at the locations indicated, except that the lengths of individual gage strips if not furnished in single section shall be provided with additional grommets on each side of the joint. The facing of each staff gage section shall be enameled 16-gage metal material of standard manufacture. The gages shall have a corrosion-resistant finish. A sample of the facing at least 2 feet long shall be submitted for approval before erection. The staff gages shall be set in concrete as directed. No concrete shall be set under posts. Concrete shall conform to requirements of Section 9. Posts shall be of S4S No. 1 structural long leaf yellow pine conforming to the grading rules of the Southern Pine Association. Posts shall be given a pressure preservative treatment using a creosote-coal-tar solution conforming to Federal Specification TT-C-650a, Class I or II. Preservative treatment process shall conform to Federal Specification TT-W-571g. Other materials shall be as shown on the drawings or as required.

c. Payment. - Payment for all work in connection with furnishing and installing staff gages will be made at the contract lump sum price for Item 40, "Staff Gages", which price shall include excavation and backfill, posts, concrete and cement.

14-05. MISCELLANEOUS METAL ITEMS-INTAKE STRUCTURES. - a. General. - This paragraph covers all metal work at the intake structure, except items specified elsewhere, and includes manhole cover and frame, trash rack, pipe railing, platform and supports, hand grab, ladders, and ladder safety guard. All items specified in this section shall be painted as specified in Section 16 for ferrous metal surfaces subject to immersion in fresh water.

b. Workmanship. - Items furnished, unless otherwise specified or indicated shall be standard manufacturer's products fabricated in accordance with the best shop methods. All welding shall be in accordance with AWS Standard Code D1.0-46 "Arc and Gas Welding in Building Construction". All exposed fastenings shall be of the same material, color and finish as the metal to which it is applied, unless otherwise shown or specified. Material shall be free from defects and of the best commercial quality. Supplementary parts necessary to complete each item, though such part is not definitely shown or specified, shall be included. All nuts and fastening devices shall be tight. Lock washers shall be used under all nuts.

c. Shop Drawings. - Shop drawings for the items hereinafter specified shall be submitted for approval and shall indicate thickness of metal, all dimensions, construction details, reinforcement and anchorage.

d. Structural Steel. - Structural steel shall be welding type steel and shall conform to ASTM A373-58T, ASTM A36-617, or Federal Specification QQ-S-74la, Type II.

e. Anchors, Bolts and Nuts. - (1) Cinch anchors shall be similar and approved equal to "Star Slugin" compound anchor, 3-unit threaded set, as manufactured by Star Expansion Industries, and shall be provided with bearing sleeves. Bolts shall be of corrosion resisting steel and shall conform to subparagraph (2) below. Other anchors for ladders and grab bars shall be of expansion shield type.

(2) Bolts and nuts, including anchor bolts, shall conform to the applicable requirements of Federal Specification FF-B-575b and FF-N-836. Where "CRES" is indicated or where corrosion resisting bolts and nuts are shown, material for bolts and nuts shall be corrosion-resisting steel as specified in the applicable Federal Specifications. Washers of required thickness and of same material of nuts shall be provided under all nuts.

f. Metal Gratings. - Gratings for platform and treads shall conform to the applicable requirements of Federal Specification RR-G-661a, Type I, except galvanizing is not required. Gratings and frames shall be of all-welded construction. Stair treads and platform shall be provided with abrasive nosing. Stair treads shall be standard grating treads of 1-1/4" x 3/16" bearing and cross bars. Platform grating shall be sized as shown.

g. Ladder Safety Guard. - Ladder safety guard shall be a metal-basket-type guard made up of steel straps and hoops. Straps and hoops shall be of sizes shown. The entire assembly shall be rigidly built and securely attached to ladder by riveting or welding.

h. Ladders. - Ladders shall be of the bar and rung type constructed of structural steel in accordance with the details and the following minimum requirements. Stringers shall be a minimum of 3/8 inch by 2-1/2 inch mild steel bars fitted with anchors for securing to concrete. Rungs shall be 3/4 inch minimum round, solid section steel rod, fitted into punched holes in stringers, welded and ground smooth. Ladders shall be secured at each end and at intermediate points not over 6-feet on center.

i. Hand Grab Bar. - Hand grab bar shall be fabricated and installed as shown.

j. Pipe Railing. - (1) Pipe railing shall unless otherwise indicated or specified, be furnished and installed in accordance with the requirements of Paragraph 11-07. Railing shall be ungalvanized.

(2) Railing shall be anchored to grating platform and treads as detailed.

k. Access Manhole Cover and Frame. - Frame and cover shall be of cast iron and shall conform to the drawings in all essentials of design. Approved standard castings differing in nonessential details will be acceptable. The frame and cover shall conform to QQ-I-652a. The cover shall be equipped with a bronze locking device actuated from the top. An operating wrench shall be furnished.

l. Payment. - Payment for all work specified in this paragraph including painting will be made at the lump sum price for Item No. 41 "Miscellaneous Metal Items - Intake Structure".

14-06. WOOD STOP LOGS. - Wood stop logs shall be provided as indicated and shall be made of S4S No. 1 structural longleaf, yellow pine conforming to the grading rules of the Southern Pine Association. Logs shall be treated with a creosote-coal-tar distillate or solution conforming to Federal Specification TT-C-645a, Class II, or TT-C-650b, Class I or II, by the pressure process conforming to Federal Specification TT-W-571g. Logs shall be installed in slots. Payment for wood stop logs as specified above, completed and accepted will be made at the lump sum price for Item No. 43, "Wood Stop Logs", which price shall include all costs in connection therewith.

SECTION 15

BITUMINOUS CONCRETE PAVEMENT
(Item 42)
(Index)

SECTION 15

BITUMINOUS CONCRETE PAVEMENT
(Item 42)

15-01. SCOPE. - This section covers the construction of hot-mix pavement including construction of bituminous concrete lip curbs and the application of a bituminous prime coat on a previously prepared base course for the Parking Area, complete. Base course is specified and included under Section 6.

15-02. DESCRIPTION. - The 2-inch pavement shall be constructed on the primed base in a single course or at the option of the contractor in two courses, each 1-inch in thickness.

15-03. PRIME COAT. - a. Asphalt. - Bituminous material for the prime coat shall conform to Federal Specification SS-A-671a and Amendment 1, designation MC-0 or MC-1.

b. Rate of Application. - Prime coat shall be applied at the rate of approximately 0.40 gallons per square yard of base course. The exact quantity, which may be varied to suit field conditions, will be determined by the Contracting Officer.

c. Certified Analysis. - The source from which the bituminous material is to be obtained shall be selected before the material is required for use in the work, and a copy of the certified analysis representative of the material to be employed in the work shall be submitted for approval not less than 15 working days before commencing work.

d. Weather Limitations. - Prime coat shall be applied only when the atmospheric temperature has not been below 35 degrees for 12 hours, and the temperature in the shade is not less than 50°F., immediately prior to application.

e. Curing. - Following the application of prime material, the surface shall be allowed to dry without being disturbed for a period of not less than 48 hours, or longer, as may be necessary to attain penetration into the base and evaporation of the volatiles from prime material.

15-04. BITUMINOUS CONCRETE PAVEMENT. - The bituminous concrete pavement shall conform to Section 406, Class I, Dense Graded Bituminous Concrete Pavement of the Standard Specifications for Roads, Bridges, and Incidental Construction, State of Connecticut, State Highway Department.

a. Pavement Thickness. - Pavement thickness shall be as noted in Paragraph 13-02, above.

b. Junctions of New and Existing Pavement. - New pavement shall meet road pavement at location shown. The junction shall be neatly made to the approval of the Contracting Officer.

15-05. LIP CURBING. - Lip curbing where indicated on the drawings shall be 9 inches in base width and 6 inches high in accordance with Connecticut Standard Sheet No. 222C. Lip curbing shall be constructed in accordance with Section 8.15, Bituminous Concrete Lip Curbing, of the State of Connecticut Standard Specifications.

15-06. PAYMENT. - Payment for all work specified in this section will be made at the lump sum price for Item No. 42, "Bituminous Concrete Pavement".

SECTION 16

PAINTING
(Index)

SECTION 16

PAINTING

16-01. GENERAL. - a. Scope. - (1) The work covered by this section of the specifications shall consist of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with the preparation of surfaces, application of all paint or other materials and the manufacture of paints, paint materials and miscellaneous materials incidental thereto, (except as otherwise specified) complete in strict accordance with the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

(2) Surfaces to be painted shall receive the treatment and number of coats prescribed in the painting schedule.

b. Requirements. - No paint will be applied under this section to the following materials or surfaces:

(1) Metal surfaces that are to be encased or embedded in concrete.

(2) Galvanized iron and steel.

(3) Concrete surfaces.

(4) Factory finished items.

(5) Corrosion-resisting steel.

(6) Items included to be painted under other sections.

c. Definitions and Nomenclature. - (1) Paint. - The term "paint" as used herein includes emulsions, enamels, paints, stains, varnishes, sealers, and other coatings, organic or inorganic, whether they be used as prime, intermediate, or finish coats. This definition does not include troweled or metal-sprayed coatings.

(2) Shop Painting. - The term "shop painting", as referred to herein and/or on the drawings, covers operations conducted on painting material or equipment in a shop or plant before shipment to the site of erection or installation.

(3) Field Painting. - The term "field painting", as referred to herein and/or on the drawings, covers the application of paint coats at the construction site.

(4) New surfaces refers to unpainted surfaces of newly fabricated structures and items which are to receive paint coats.

(5) Touch-up painting refers to the application of paint on small areas of painted surfaces to repair mars and scratches and to restore the coating to an unbroken condition.

(6) Repainting designates the cleaning and recoating of extensive areas on which the existing coatings have deteriorated or otherwise do not provide adequate surface protection.

(7) Blast cleaning designates the cleaning of surfaces by forceful impingement of abrasive particles thereon by air blast or centrifugal action and includes sandblasting and gritblasting.

d. Standard Specifications. - Materials specified herein to meet the requirements of standard specifications published by national authorities shall conform with the issue in effect on the date of invitation for bids. National authorities publishing standard specifications referred to herein with the abbreviations used are as follows:

Agency	Abbreviation
Office of Standardization, Dept. of Defense	MIL
General Service Administration	Fed. Spec.

e. Samples and Tests. - One-quart samples of each batch of each type and color of paint proposed for use shall be submitted to the Contracting Officer and approval thereof received before the material represented by the sample is used on the project. In addition to furnishing samples, the contractor shall submit certified reports of tests thereof to the Contracting Officer, indicating compliance with the specifications.

f. Payment. - Payment for all work performed and for all materials furnished under this section of the specifications will be included in the contract prices for the items on which the work is performed, and to which the materials are applied.

16-02. CLEANING AND PREPARATION OF SURFACES. - a. General. - Surfaces to be painted shall be clean before applying paint or surface treatments. The removal of oil and grease shall, in general, be accomplished with mineral spirits or other low-toxicity solvents having a flash point above 100°F. before mechanical cleaning is started. Solvent cleaning shall be done with clean cloths and clean fluids to avoid leaving a thin film of greasy residue on the surfaces being cleaned. Where blast cleaning is used, minor amounts of grease and oil contaminants need not be removed with solvents provided the abrasive is not reclaimed and reused and provided the blast cleaning process, by itself, leaves the surfaces completely free of grease and oil.

Cleaning and painting shall be so programmed that dust or other contaminants from the cleaning process do not fall on wet, newly painted surfaces. Surfaces not intended to be painted shall be suitably protected from the effects of cleaning and painting operations. Fabricated, assembled items which are normally cleaned and painted in the shop in accordance with the manufacturer's standard practice will be considered for exemption from the detailed cleaning and painting requirements set forth herein, upon specific request of the contractor. Machine-finished and other bare metal surfaces, which are not to be painted, but which will require temporary protection during construction, shall be treated with rust-preventive compound conforming to MIL Spec. MIL-C-16173A, Grade I, unless otherwise specifically indicated. Removable equipment adjacent to surfaces to be painted shall, if necessary, be disconnected and moved to permit cleaning and painting of said surfaces, and replaced by workmen skilled in the trades involved.

b. Cleaning and Preparation of Ferrous Surfaces. - (1) Surfaces in Exterior or Interior Atmospheric Exposure. - Ferrous surfaces which will be completely and continuously in normal exterior or interior atmospheric exposure (see schedule) shall be cleaned in the shop or place of manufacture. Grease, dirt, and other soiling substances shall be removed by means of emulsions, steam, solvents, and/or other approved methods. Rust and loose mill scale shall be removed by high speed-power brushing, scraping, chipping, disc-sanding or other approved means. Preparation of surfaces by blasting to at least the degree of surface cleanliness indicated for the other methods of mechanical cleaning may be used at the option of the contractor. The use of chipping tools with action so severe as to produce cuts, burrs and other forms of excessive surface roughness will not be permitted. "Tight" mill scale, i.e., that which cannot be lifted by applying a sharp knife to any edge, will be permitted. Minor amounts of residual rust, not removable except by thorough blast cleaning, will be permitted but stratified rust (scale) shall be removed in any event. Welds and adjacent surfaces to the extent affected by welding shall be given special treatment by scraping, chipping and wirebrushing to insure that flux, slag and weld spatter are removed. Following mechanical cleaning, the weld and adjacent surfaces shall be treated in an approved manner. Surfaces shall be primed in the shop as soon as practicable after cleaning with the linseed oil type primer specified for atmospheric exposed steel. (See schedule.) Weathering of fabricated, unpainted steel for any purpose will not be permitted unless the surfaces are subsequently to be blast cleaned of all mill scale and rust to base metal. Prior to applying subsequent coats, all welds and other damaged areas of shop-primed surfaces shall be field cleaned and reprimed as previously specified.

(2) Cleaning and Pretreatment of Ferrous Surfaces in Underwater Exposure. - Surfaces of structural components which will be

subject to extended periods of immersion or otherwise as required (see schedule) shall be cleaned of all rust, mill scale and other foreign matter to base metal by dry blast cleaning. Blast cleaning shall be done in the field after erection unless specifically authorized otherwise by the Contracting Officer. Surfaces to be coated which will not be accessible after erection shall be cleaned and painted before becoming inaccessible. The cleaned surfaces shall be of a uniform gray-white metallic color, completely free of mill scale, rust, oxide, paint, welding slag, weld spatter or other foreign material. Where necessary, power tools shall be used in conjunction with blast cleaning to effect the removal of weld spatter and heavy, stratified rust scale. Blast cleaning shall be accomplished with sand, crushed iron or steel grit or synthetic nonmetallic grit of such particle shape, hardness and gradation as to effectively clean the metal and leave a roughened surface suitable for tenacious adhesion of subsequent coatings. The maximum particle size of any type of abrasive shall be no larger than that passing a No. 16 mesh screen, U. S. sieve series. Nonmetallic abrasives shall be dustfree and no more than 10% shall pass a No. 50 mesh sieve. The contractor shall take all precautions to prevent damage to machinery and surfaces not requiring blast cleaning and to prevent dust from settling into any adjacent films of wet paint. As soon after cleaning as practicable and prior to the formation of any detectable condensation or corrosion, all blast-cleaned ferrous surfaces shall be cleaned of dust and abrasive particles by brushing, vacuum and/or blow-down with clean, dry compressed air, and given the first coat of paint including any pretreatment, required by the schedule. In no event, shall blast-cleaned surfaces stand overnight without having received the specified pretreatment and/or the first coat of paint prescribed by the schedule. Structural features or components, which are subject in part to atmospheric exposure and in part to immersion in water, shall be prepared and painted as though the entire component were subject to immersion. Surfaces requiring complete removal of mill scale shall be cleaned in the field, except that upon written request by the contractor, the Contracting Officer may authorize mill or shop cleaning of assembled or partially assembled components specified to receive a vinyl type paint system. The surfaces, if shop-cleaned, shall be blasted, pretreated if required, and coated with the paint specified in the schedule for the first coat. The dry film thickness of the shop-applied coating shall be 2.0 to 2.5 mils, irrespective of the number of passes or coats required to achieve this thickness. This pre-erection or construction period coating shall be maintained in good condition by recleaning and touching up any areas damaged during the construction period. Prior to the field application of subsequent coats to obtain the prescribed total film thickness, soiled areas of the pre-erection coating shall be thoroughly cleaned with mineral spirits and all welds or other unpainted or damaged areas shall be cleaned and primed in such a manner as to make them equivalent to adjacent, undamaged paint surfaces.

16-03. PAINT APPLICATION. - a. General. - All work shall be done in a workmanlike manner, so that the finished coating will be free from holidays, pinholes, bubbles, runs, drops, ridges, waves, laps, unnecessary brush marks and variations in color, texture and gloss. All coats shall be applied in such manner as to produce an even film of uniform thickness. Edges, corners, crevices, seams, joints, welds, rivets and other surface irregularities shall receive special attention to insure that they receive an adequate thickness of paint. Care shall be exercised during spraying to hold the nozzle perpendicular to and sufficiently close to the surfaces being painted to avoid loss of material into the air, or the bridging over of crevices and corners. Spray equipment shall be equipped with traps, separators, mechanical agitators, pressure gages and pressure regulators. Aircaps, nozzles and needles shall be as recommended by the spray equipment manufacturer for the material being applied. Spray painting shall be supplemented by brushing or other means where necessary to properly coat crevices, pockets, interior angles and other surfaces which cannot be satisfactorily coated by spray. Respirators shall be worn by all persons engaged or assisting in spray painting.

b. Paint Properties, Labeling, Storage, Mixing and Thinning. - All paint, when applied, shall provide a satisfactory film and a smooth, even surface. Pigmented paints shall be furnished in containers not larger than 5 gallons. Paints shall be thoroughly stirred, strained and kept at a uniform consistency during application. Paste pigments, specified to be added at the time of use, shall be mixed as follows: place the pigment in a separate container and add small increments of the required vehicle or base paint, with thorough stirring, until a viscous, smooth, homogeneous, lump-free mixture is obtained. Mix in the remainder of the vehicle or base paint by boxing and stirring. Powered metallic pigments, added at the time of use, shall be mixed by adding the powder in small increments to about one-third of the required base paint or vehicle, with thorough mixing to obtain a smooth mixture. The remainder of the vehicle or base paint shall then be thoroughly stirred in. Where necessary, in the opinion of the inspector, to suit conditions of surface, temperature, weather and method of application, the packaged paint may be thinned immediately prior to use by the addition of not more than one pint per gallon of the proper thinner; provided that in no case shall the paint be reduced more than is absolutely necessary to obtain the proper application characteristics. Vinyl paints may be thinned more than the maximum indicated above (see specific directions for applying vinyl type paints). Paint shall be delivered to the job in unbroken containers which shall show the designated name, formula or specification number, color, batch number, any special directions, manufacturer and date of manufacture, all of which shall be plainly legible at the time of use. Paints which can be harmed by exposure to cold weather shall be stored in heated shelters. During application, the paint in the spray tank or other working container shall be not less than 50°F.

c. Atmospheric Conditions. - Paint shall be applied only to surfaces which are completely free of moisture as determined by sight or touch. In no case shall any paint be applied to surfaces upon which there is visible frost or ice. While painting is being done, the temperature of the surfaces to be painted and of atmosphere in contact therewith, shall be maintained at or above 45°F. Where paints are being used which dry solely by evaporation of organic solvent, such as the vinyl type paints, the temperature of air and surface may be 35°F., or as approved by the Contracting Officer. During periods of inclement weather, painting may be continued by inclosing the surfaces with temporary shelters and applying artificial heat, provided the minimum air, surface and paint temperatures prescribed above are maintained. Paint shall not be applied to surfaces which are hot enough to cause blistering or pinholing of the film.

d. Protection of Paint Surfaces. - Where shelter and/or heat are provided for paint surfaces during inclement weather such protective measures shall be maintained until the paint film has dried, and/or discontinuance of the measures is authorized. Items which have been painted shall not be handled, worked on or otherwise disturbed until the paint coat is completely dry and hard. After delivery at the site of permanent erection or installation, all shop-coated metalwork shall be stored out of contact with the ground in such a manner as will minimize the formation of water-holding pockets and in such a location as will minimize soiling, contamination and deterioration of the paint film. Shop-coated metal shall be repainted or retouched from time to time with the specified paint, whenever in the opinion of the Contracting Officer it becomes necessary to maintain the integrity of the film.

e. Contacting Surfaces. - When riveted or bolted contact is to exist between surfaces of ferrous or other metal parts of substantially similar chemical composition, such surfaces will not be required to be painted. Contacting surfaces formed by high-strength bolt connections shall not be painted. Where an electrical potential is apt to exist between metal surfaces of unlike chemical composition in riveted or bolted contact, each of the contacting surfaces shall be cleaned, pretreated, and given one coat of primer, all as specified for the particular metals involved. Where a nonmetal surface is to be in riveted or bolted contact with a metal surface, the contacting surfaces of the metal shall be cleaned, pretreated if required, and given three coats of the specified primer.

f. Time between Surface Preparation and Painting. - Surfaces which have been cleaned and/or otherwise prepared for painting shall be primed as soon as practicable after such preparation has been completed, but in any event, prior to any deterioration of the prepared surface.

g. Method of Paint Application. - The specified first coat of paint shall be applied by brush to ferrous surfaces which have not been blast-cleaned but may be applied by spray or brush, except as otherwise specified, to surfaces which have been blast-cleaned. All subsequent coats for all ferrous surfaces may, unless otherwise specified, be either brush or spray applied. Whenever spraying of a surface is permitted or directed, it is to be understood that all areas inaccessible to spray painting shall be coated by brushing or other suitable means.

h. Coating Progress. - Where field painting on any type of surface has commenced on any portion of the work, the complete painting operation, including priming and finishing coats, on the portion of the work, shall be completed as soon as practicable, without prolonged delays. Sufficient time shall elapse between successive coats to permit them to dry properly for recoating and this minimum drying period shall be modified as necessary to suit adverse weather conditions. Paint shall be considered dry for recoating when it feels firm and does not deform or feel sticky under moderate pressure of the finger. The application of another coat of paint shall not cause such film irregularities as lifting or loss of adhesion of the undercoat and the undercoat shall have dried sufficiently so as not to retard the drying of the next coat. At all times prior to final acceptance of the work, all coats of all painted surfaces shall be unscarred and completely integral at the time of application of all succeeding coats. At the time of application of each successive coat, undercoats shall be cleaned of dust, grease or any foreign matter, which might adversely affect intercoat adhesion, by means of air blast, solvent cleaning or other approved means. Field coats on metal shall be applied after erection except as otherwise specified and excepting surfaces to be painted which will become inaccessible after erection.

i. Drying Time Prior to Immersion. - Vinyl type paint systems shall be allowed a final dry as long as practicable, but painted surfaces shall not be immersed in water with less than 72 hours drying of the last coat.

j. Coverage and Film Thickness. - The actual surface area covered per gallon of paint shall not exceed the spreading rates prescribed in the schedule. Where no spreading rate is specified, the paint shall be applied at a rate normal for the type of material being used. In any event, the combined coats of a specified paint system shall completely hide the base surface. Where dry film thickness requirements are specified for ferrous surfaces, the measurements shall be made with a General Electric, Type B, film thickness gage, calibrated on metal identical in composition, thickness and surface preparation to the item being coated. Sufficient measurements shall be made to accurately establish average thicknesses. If available, Government-owned film thickness gage may be used by the contractor, however, all power and services to operate the gage shall be provided by contractor. Otherwise gage shall be provided by contractor.

k. Directions for Application of Vinyl Type Paints. - (1) Vinyl paints shall be spray applied, except that minor areas inaccessible to spraying shall be brushed. The vinyl paint as received shall be thinned 20 to 35 percent by volume, with T-10 thinner (90 percent toluene and 10 percent methyl isobutyl ketone). The use of other thinners will not be allowed. The amount of thinner shall be varied to suit prevailing weather conditions but shall at all times be sufficient to provide a wet spray and avoid deposition of particles which are dry when they strike the surface. Each coat required by the schedule shall consist of a preliminary, extra spray pass on edges, corners, interior angles, seams, crevices, junctions of joining members, rivet lines, weld lines and similar surface irregularities, followed by an over-all double spray coat, applied at a coverage rate of approximately 130 square feet per gallon of unthinned paint but in any event, sufficient to obtain an average dry film thickness of 1.25 to 1.75 mils. Where impracticable, because of weather conditions or other reasons, to obtain this film thickness, additional applications, at no additional cost to the Government, shall be made so that the prescribed film thickness for each type of paint used in the system is obtained. A double spray coat shall consist of giving a sizeable area of several hundred square feet a fairly thin coat of paint in one pass and then going over it again in a few minutes with a heavy, wet coat, applied just short of sagging in order to build up the prescribed film thickness. Particular care shall be exercised to insure that the spray nozzle is held close enough to the surface to avoid excessive loss of volatile material in the spraying process. The spray nozzle shall, at all times, be perpendicular to the surface being coated. Rivets and similar surface projections shall receive sprayed paint from every direction in order to insure complete coverage of all faces. Pits, cracks and crevices shall be filled with paint insofar as practicable. Fluid and atomization pressure shall be kept as low as practicable consistent with good spraying results. Alternate passes of the spray shall be at right angles to the preceding pass. Hot spray application of vinyl type paints, except vinyl wash coat, will be permitted. Undercoats shall be permitted to dry at least two hours before recoating but not more than 2 double spray coats shall be applied in one 8-hour day.

16-04. PAINTS TO BE APPLIED - NUMBER OF COATS AND FORMULAS. - a. General. - The surface preparation and paints required for various types of surface and exposure are shown in subparagraph b. below. Supplementary information for use with the schedule follows:

(1) Fabricated and assembled items which are normally painted in accordance with the manufacturer's standard practice may be exempted from the following schedule requirements for surface preparation and painting, on specific request by the contractor and approval by the Contracting Officer. Mars and scratches on surfaces painted in accordance with the manufacturer's standard practice shall be touched-up in the field to provide an appearance satisfactory to the Contracting Officer.

(2) Colors and tints shall match that specified, or shall otherwise be subject to the approval of the Contracting Officer. Where so directed by the Contracting Officer, alternate coats of paints having the same color shall be tinted with small amounts of ultramarine blue or lamp black or other approved ingredients, ground in a vehicle compatible with the paint being tinted, in order to insure that all surfaces are properly coated with the specified number of paint coats. Tinting of vinyl type paints shall be done only by the manufacturer. Unless otherwise specified, the color of undercoats shall match the color of the finish paint as nearly as practicable.

(3) The method of surface preparation and pretreatment shown in the schedule is for identification purposes only. Cleaning and pretreatment of surfaces prior to painting shall be accomplished in accordance with detailed requirements hereinbefore described.

(4) The designated titles of Federal and other standard specifications, which are identified by symbol or abbreviated name elsewhere in this specification, are as follows:

Fed. Spec.	TT-B-846b	Butyl Alcohol; Normal (for use in organic coatings).
	TT-P-343	Pigment, Carbon-black; Dry.
	TT-E-489c & Am-3	Enamel; Gloss, Synthetic (for exterior and interior surfaces).
	TT-M-268b & Am-3	Methyl Isobutyl Ketone (for use in organic coatings).
	TT-P-86c	Paint; Red-lead-base, ready-mixed.
	TT-P-320a	Pigment, Aluminum; Powder and Paste, for Paint.
	TT-P-442 & Am-1	Pigment, Titanium Dioxide (for Protective Coatings).
	TT-T-00291b & Am-1	Thinner; Paint, Volatile Mineral Spirits (petroleum-spirits).
	TT-T-548c	Toluol (for use in organic coatings).
	TT-T-656a & Am-1	Tricresyl Phosphate.
Fed. Standard	141 & Change Notices 1 & 2	Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling, and Testing.
	595 & Int. Change Notice No. 1	Colors.
MIL Spec.	MIL-C-16173B	Corrosion Preventive, Solvent Cut-back, Cold-application.

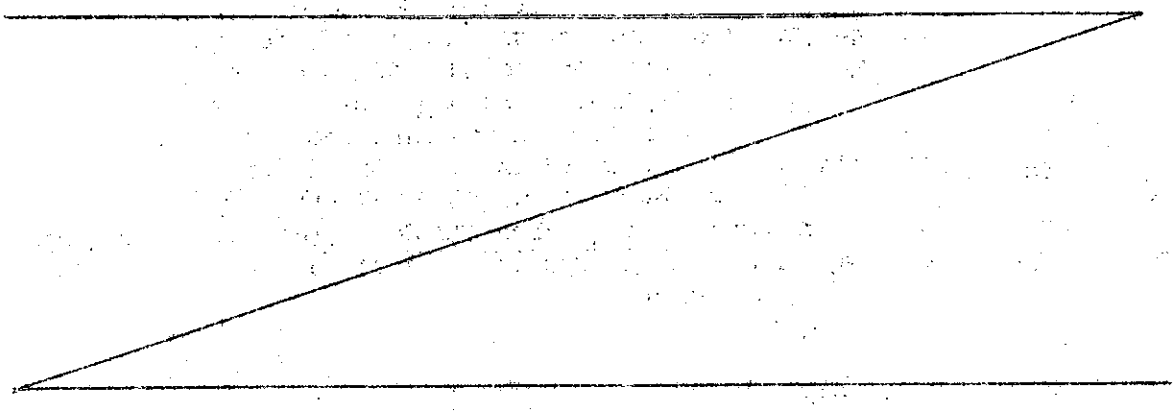
(5) Special formulations indicated in the schedule which are not covered by Federal or other nationally recognized standard specifications are shown in paragraph 16-05.

b. Painting Schedule (Exterior and Interior Surfaces). -

(1) Interior and Exterior Ferrous Surfaces Subject to Atmospheric Exposure. -

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied			
		1st Coat	2nd Coat	3rd Coat	4th Coat
Interior and ferrous surfaces subject only to atmospheric exposure, not otherwise specified.	Solvent cleaning and wire brush (or equivalent) No pretreatment	Fed. Spec. TT-P-86c Type I	Fed. Spec. TT-E-489c Class A	Fed. Spec. TT-E-489c Class A	None
Bubble Gage Shelter Door	Solvent cleaning and wire brush (or equivalent) No pretreatment	Manufacturer's Standard	Fed. Spec. TT-E-489c Class A	Fed. Spec. TT-E-489c Class A	None

Directions and Remarks: In the above system, the first coat shall be brush applied in the shop at a maximum spreading rate of 600 square feet per gallon and touched up as required in the field. The second and third coats shall be applied in the field at a maximum spreading rate of 500 square feet per gallon. In lieu of the specified system, door may be finished in accordance with manufacturer's practice, when specifically approved by the Contracting Officer. Finish color shall be 16492 (gray).



(2) Ferrous Surfaces Subject to Immersion in Fresh Water. -

Surface	Surface Preparation and Pre-treatment	Paint Formulas to be Applied: 1st Double Spray Coat	2nd Double Spray Coat	3rd Double Spray Coat	4th Double Spray Coat
Exterior and interior surfaces of ferrous components which are in whole or in part subject for extended periods to immersion in water or to frequent moisture condensation including sluice gates, and gate hoist stand, bubble gage inlet, and all ladders, pipe railing, trash rack, and miscellaneous metal items at the intake structure of the outlet works.	Blast clean only (no pretreatment)	Vinyl V-766 (white)	Vinyl V-766 (gray)	Vinyl V-102a	Vinyl V-102a

Directions and Remarks: The above vinyl type system shall be spray applied to an average dry film thickness of at least 6.0 mils for the completed system and the minimum thickness at any point shall be not less than 5.0 mils. Three to four mils of the total dry film thickness shall be built up with V-766. The number of coats indicated above is intended as a guide only and may not furnish the required film thickness under certain weather conditions or with operators unfamiliar with the vinyl paints. The specified film thickness shall be attained in any event and any additional coats needed to do so shall be applied at no additional cost to the Government. Entire surfaces of the designated item shall be cleaned and painted as though subject to immersion even though part of the surfaces will be only in atmospheric exposure. Tinting of the V-766 paint to obtain the required alternate colors shall be done by the manufacturer. Tinting of vinyl paint in the field will not be permitted. See specific directions for applying vinyl type paints.

16-05. SPECIAL PAINT FORMULATIONS NOT COVERED BY STANDARD SPECIFICATIONS. - a. Exceptions. - The provisions and raw materials specified in this section are applicable only to the special

paint formulations shown hereinafter in detail and not to those finished-product coatings governed by Federal or other Standard Specifications.

b. General. - Paints shall have the composition as indicated in the formulas listed herein. Except where otherwise specified or authorized, all paint shall be made by grinding together dry pigments and a liquid vehicle to form a smooth paint that will flow freely and will not settle or react deleteriously in containers. Where so specified, special pigments shall be packed in separate containers for mixing on the job. Unless otherwise specified, grinding shall produce a fineness such that coarse particles and skins will not exceed 1.5 percent (total residue left on No. 325 screen) based on pigment. All paints shall be so processed as to insure that within a period of one year from date of manufacture, they will not gel, liver or thicken deleteriously, or form gas in the closed container.

c. Inspection and Tests. - Inspection and tests, except as otherwise indicated, will be performed in accordance with the applicable provisions of the latest current revision of Federal Standard 141, entitled "Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling and Testing."

d. Packaging and Labeling. - Paints and vehicles shall be packaged in standard containers not larger than 5 gallons in size, with removable friction or lug-type covers. Containers for vinyl type paints shall be lined with a coating resistant to the solvents in the formulations and capable of effectively isolating the paint from contact with the metal in the container. Each container shall be clearly and durably labeled to indicate the purchaser's order number, date of manufacture, manufacturer's batch number, quantity and full name and color of the material. Pigmented paints shall be packaged in containers not larger than 5 gallons.

e. Colors and Tints. - Colors where specified shall conform to the listed chip on latest revision of Fed. Standard 595 "Colors." If not specified, the color shall be that naturally obtained from the required pigmentation.

f. Paint Formulations. - (1) Formula V-102a; Aluminum Paint, Vinyl Type. -

Ingredient	% by Wt.
Vinyl Resin, Type 3	17.7
Tricresyl Phosphate Plasticizer	4.3
Aluminum Powder	7.0
Toluene	35.5
Methyl Isobutyl Ketone	35.5
	100.0

Formula V-102a shall be furnished with the aluminum pigment mixed into the vehicle. Samples of Formula V-102a submitted for approval shall include separate samples of all ingredient materials.

(2) Formula V-766; Vinyl Type White or Gray Paint. -

Ingredient	Parts by Weight
Vinyl Resin Type 3	8.7
Vinyl Resin Type 4	8.7
Titanium Dioxide (Type III) and tinting pigments	13.3
Tricresyl Phosphate Plasticizer	3.3
Toluene	23.1
Methyl Isobutyl Ketone	42.85
Propylene Oxide	0.05
	100.00

This dispersion of pigment for Formula V-766 shall be accomplished by means of pebble mills or other approved methods. Grinding of this formulation in steel lined or steel ball mills will not be permitted. No grinding aids, antisettling agents or any other materials except those shown in the formula will be permitted. A 1.5 mil (dry) film of the paint, spray applied to a clean, cold-rolled steel panel and dried 48 hours, shall exhibit excellent adhesion. The fineness of grind (Fed. Standard 141b, Method 441.1) shall be not less than 7. Unless otherwise directed, half of the V-766 paint shall be furnished as white and the remaining half gray, the latter obtained by thoroughly dispersing carbon black into the formulation. The gray color shall approximate Color No. 26231 of Fed. Standard 595. Samples of Formula V-766 submitted for approval shall include separate samples of all ingredient materials.

g. Ingredient Materials. - (1) Titanium Dioxide shall conform to Fed. Spec. TT-P-442 for "Pigment; Titanium Dioxide; (for Protective Coatings)" Type III, Grade A.

(2) Carbon black shall conform to Fed. Spec. TT-P-343 for "Pigment, Carbon Black; Dry," Form I or II, Class B.

(3) Tricresyl Phosphate Plasticizer shall conform to Fed. Spec. TT-T-656 entitled "Tricresyl Phosphate".

(4) Vinyl Resin, Type 3 shall be a vinyl chloride-acetate copolymer of medium average molecular weight and shall contain 85 to 88 percent vinyl chloride and 12 to 15 percent vinyl acetate by weight. The resin shall have film-forming properties and shall, in the specified formulations, produce results equal to "Vinylite" resin VYHH as manufactured by the Bakelite Company.

(5) Aluminum powder shall conform to Federal Specification TT-P-320a, Type I, Class B.

(6) Vinyl resin, Type 4 shall be a copolymer of the vinyl chloride-acetate type, shall contain (by weight) 1 percent interpolymerized dibasic acid, 84 to 87 percent vinyl chloride and 12 to 15 percent vinyl acetate. The resin shall have film-forming properties and shall, in the specified formulations, produce results equal to "Vinylite" resin VMCH as manufactured by the Bakelite Company.

(7) Mineral spirits shall conform to Federal Specification TT-T-00291b "Thinner; Paint Volatile Mineral Spirits (Petroleum Spirits)."

(8) Toluene shall conform to Federal Specification TT-T-548 "Toluol (for Use in Organic Coatings)."

(9) Butanol shall conform to Federal Specification TT-B-846b "Butyl Alcohol; Normal (for Use in Organic Coatings)."

(10) Methyl Isobutyl Ketone (MIBK) shall conform to Federal Specification TT-M-268, "Methyl Isobutyl Ketone (for Use in Organic Coatings)."

(11) Thinner T-10 for vinyl coatings shall consist of 10 percent methyl isobutyl ketone (by weight) and 90 percent toluene.

(12) Propylene oxide shall be a commercially pure product suitable for the intended use.

SECTION 17

TOPSOILING, SEEDING AND MULCHING
INDEX

SECTION 17

TOPSOILING, SEEDING AND MULCHING

17-01. SCOPE. - This section includes all operations in connection with topsoiling, fine grading, fertilizing, liming, seeding, mulching, and establishment of turf.

17-02. MATERIALS. - a. Topsoil. - Stripping material consisting of the upper layer or layers of humus and soil shall be salvaged from areas where grading or excavation is required, and/or from areas upstream of the dam below elevation 500.0, in a quantity sufficient for topsoiling requirements. In salvaging such material, clearing and grubbing shall be accomplished where necessary as required. Immediately following the clearing and grubbing operations, roots, stones, stumps and similar materials shall be removed from the soil to the depth of salvage by means of a bulldozer equipped with a root raking blade (Drott 95 inch width on IH-TD9 to Drott 151 inch on IH-TD25 or equal) by a tractor drawn stone rake or by similar means. The materials shall not be salvaged, stockpiled or reused until it has been demonstrated to the Contracting Officer that removal of stones, stumps, roots and other material having a dimension of 4" or over has been accomplished. Such salvaged material shall be called "topsoil". If a sufficient amount is not salvaged on the project site, other topsoil shall be furnished by the contractor from approved sources off the site at no additional cost to the Government.

b. Fertilizer. - Fertilizer shall be 10-6-4 grade, uniform in composition, granular free-flowing and suitable for application with approved equipment, delivered to the site in bags or other convenient containers, each fully labeled, conforming to the applicable State fertilizer laws, and bearing the name, trade name or trade-mark, and warranty of the producer.

c. Lime. - Lime shall be ground limestone containing not less than 85 percent of total carbonates and shall be ground to such fineness that at least 50 percent will pass through a 100-mesh sieve and at least 90% will pass through a 20-mesh sieve. Coarser materials will be acceptable provided the specified rates of application are increased proportionately, on the basis of quantities passing the 100-mesh sieve, but no additional payment will be made for the increased quantity.

d. Seed. - All seed used shall be labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act in effect on the date of Invitation for Bids. All seed shall be furnished in sealed standard containers, unless exception is granted in writing by the Contracting Officer. Seed which has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable. The analysis of seed in each lot of mixture shall be as follows:

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Kind of Seed (Botanical Name) (Common Name)	% by Wt. In Mixture	Min. % Purity	Min. % Germ.
Agrostis tenius hv. Highland Bentgrass	5	98	85
Bromus inermis Smooth Brome	10	85	90
Festuca elatior arundinaceae hv. Alta Fescue	30	98	85
Festuca rubra Red Fescue (Columbia County Strain)	35	98	85
Poa Compressa Canada Bluegrass	15	80	75
Trifolium repens White Clover (New York Wild Strain)	5	98	85

Note: Weed seed not to exceed 1.0% of total mixture.

e. Mulch. - To be used on all seeded areas.

(1) General. - Acceptable mulch shall be any of the following materials, or other approved locally available material. Mulch material which contains an excessive quantity of mature seed of noxious weeds or other species which would grow and be detrimental to the desired turf, or provide a menace to surrounding farm land will not be acceptable. Straw or other mulch material that is fresh or excessively brittle, or that is in such an advanced stage of decomposition as to smother or retard growth of grass, will not be acceptable.

(a) Straw shall consist of the threshed stalks of oats, wheat, barley, rye, rice, flax, beans, peas or peanuts.

(b) Hay shall be cured, dried and shall be made up of native grasses, marsh or beach grasses or sedges.

17-03. INSPECTION AND TESTS. - a. Topsoil.-At least 30 days prior to the intended delivery of off-site topsoil, the contractor shall notify the Contracting Officer of the sources from which topsoil is to be furnished. The topsoil proposed for use will be inspected by the

Contracting Officer to determine whether the selected soil or soils meet the requirements. At the time of inspection, the Contracting Officer will require representative soil samples to be taken from several locations on the area(s) under consideration, to be tested for physical properties and PH (or lime requirement), for organic matter, and for available nitrogen, phosphoric acid and potash. Samples shall be supplied by the contractor at no additional cost to the Government, and tests will be made under the supervision of the Contracting Officer without cost to the contractor. Sampling and testing will be in accordance with standard practices of soil testing. Topsoil shall be approved prior to use. Topsoil from off-site sources shall be required to contain not less than 5% nor more than 20% organic matter as determined by loss on ignition of the ovendried samples, and shall contain a concentration of nutrients equal to that in any Government furnished topsoil. If, after the testing of the samples, the topsoil is found to be not in accordance with these specifications, the Contracting Officer may require as a requisite for acceptance, that the contractor, without additional compensation, add humus as directed, to the topsoil proposed for use, in order to make the material acceptable, and that he add fertilizer as directed in addition to the quantity specified, to raise the concentration of nutrients to a level equal to that in the Government furnished topsoil, after fertilization. The depth to which topsoil is to be stripped shall be as approved, and samples drawn from the area shall be taken from the full stripping depth approved.

b. Fertilizer and Lime. - The Contracting Officer shall be furnished with duplicate copies of invoices for all fertilizer and lime used on the project. Invoices for fertilizer shall show the grade furnished. Invoices for lime shall show total minimum carbonates and minimum percentages of the material furnished that pass the 100 and the 20-mesh sieves. Each lot of fertilizer and lime shall be subject to sampling and testing at the discretion of the Contracting Officer. Sampling and testing will be in accordance with the official methods of the Association of Official Agricultural Chemists. Upon completion of the project, a final check of the total quantities of fertilizer and lime used will be made against the total area seeded, and, if the minimum rates of application have not been met, the Contracting Officer may require the distribution of additional quantities of these materials to make up the minimum application specified.

c. Seed. - The Contracting Officer shall be furnished with duplicate signed copies of a statement from the seed vendor, certifying that each container of seed delivered is fully labeled in accordance with the Federal Seed Act and is at least equal to the specification requirements for seed in the MATERIALS paragraph of this section of the specifications, as furnished with the purchase order. This certification shall appear on, or with, all copies of invoices for the seed. Each lot of seed shall be subject to sampling and testing at the discretion of the Contracting Officer. Sampling and testing will be in accordance with the latest Rules and Regulations under the Federal Seed Act.

d. Mulch. - No less than 30 days prior to commencement of mulching operations, the contractor shall notify the Contracting Officer of the sources from which the mulch materials are to be secured and the quantities thereof, and representative samples of the materials proposed to be used shall be furnished for approval.

e. Nomenclature. - The scientific and common names of seed materials specified herein conform with the latest approved names listed in "Standardized Plant Names" (1942 Edition) prepared by the American Joint Committee on Horticultural Nomenclature. Variety names not included therein are in conformance with names adopted by the U.S. Department of Agriculture and generally accepted in the seed trade.

17-04. AREAS TO BE TOPSOILED AND SEEDED. - The following areas shall be topsoiled, seeded, mulched, and otherwise treated as required by this section of the specifications:

a. Areas as indicated on the drawings.

b. Areas not indicated on the drawings but which fall within the meaning of GC-9. These areas shall be treated at no additional cost to the Government.

c. Areas. - All areas disturbed by contractor's operations including areas falling outside the limit of work line, areas within the limit of work line where no work is indicated on the drawings, and areas used for the convenience of the contractor including haul roads, storage areas, access roads, field office sites, parking areas, stockpile areas and areas of similar use, unless specifically exempted in writing by the Contracting Officer. These areas shall be treated at no additional cost to the Government.
The provisions of this paragraph do not exempt the contractor from responsibility for vegetation other than grass, such as trees and shrubs, in accordance with GC-9 of these specifications.

d. Spoil Areas. - The contractor shall fertilize and seed all spoil areas unless otherwise noted on the drawings. If the surface of spoil areas is rough, stony, or otherwise unsuitable for seeding, the Contracting Officer will require topsoiling.

e. Borrow Area. - The borrow area treated in accordance with the provisions of Section 3 EXCAVATION of these specifications shall be seeded, fertilized and mulched in accordance with this section of the specifications.

f. Spillway Areas and Construction Areas. - The spillway slopes, the approach channel and discharge channel, the slopes of the outlet channel, the slopes of the Service Road, and the construction work areas shall be topsoiled, fertilized, seeded, and mulched.

g. Exposed Rock Surfaces. - Exposed rock surfaces on slopes shall not be topsoiled or seeded, nor shall exposed rock in borrow areas be covered with stripping material. However, pockets of earth occurring on otherwise rock slope surfaces shall be topsoiled and seeded, and in borrow areas shall be covered with stripping material and seeded.

17-05. PREPARATION OF SUBGRADE. - a. General. - Equipment necessary for the proper preparation of the ground surface and for handling and placing all materials required shall be on hand, in good condition, and shall be approved by the Contracting Officer before the work is started.

b. Clearing of Subgrade. - Prior to grading and tillage operations, all vegetation on the site sufficient to interefere with grading or tillage operations shall be mowed, grubbed, raked, and burned or removed from the site, or, when suitable, it shall be used for mulch as directed by the Contracting Officer. Prior to or during grading and tillage operations, the ground surface shall be cleared of all stumps, stones larger than 2 inches in diameter, roots, cable, wire, grade stakes, and any other materials which might hinder proper grading, tillage, or subsequent maintenance operations.

c. Grading of Subgrade. - Grades on the areas to be topsoiled which have been established by others, as shown on the drawings, shall be maintained in a true and even condition. Maintenance shall include necessary repairs to previously graded areas. Where the grades have not been established, the areas shall be graded to finish grade elevations less the depth of topsoil to be applied, as shown on the drawings, and all surfaces shall be left at the prescribed grades in an even and properly compacted condition so as to prevent the formation of depressions where water will stand. The subgrade elevation at any point shall not vary more than plus or minus one tenth foot from finish grade elevations less the depth of topsoil, as shown on the drawings. Swales, ditches, slopes and level areas shall be accurately graded to required subgrade elevations.

d. Tillage of Subgrade. - After the areas required to be topsoiled have been brought to the proper subgrade parallel to the finished grades shown on the drawings, and immediately prior to dumping and spreading the topsoil, the subgrade shall be loosened by disking, or by scarifying to a depth of at least 2 inches, to permit bonding of the topsoil to the subgrade. On banks and inclines, the subgrade finish shall be loosened by harrowing in rows parallel to the contours of the slope. All other equipment to be employed on such slopes shall be operated similarly.

e. Approval of Subgrade. - There will be no application of topsoil made without the prior approval of the finished subgrade by the Contracting Officer.

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17-06. OBTAINING TOPSOIL. - After inspection and approval by the Contracting Officer of the sources(s) of topsoil, and prior to stripping, rank growths of vegetation, stones, or debris on the surface which might interefere with grading or later tillage operations shall be removed. Sod or other cover that cannot be disked or otherwise incorporated into the topsoil before or after delivery, in such manner that it can be spread properly, shall be removed. Topsoil is to be made available on areas to be excavated and on areas below elevation 500.0 (See Par. 17-02) and shall be removed to the required depth from the designated areas prior to the beginning of grading operations. The topsoil removed from areas to be stripped or areas to be graded, or obtained from designated Government stockpiles, shall be kept separate from other excavated material. All topsoil, regardless of the source, shall be transported and placed by the contractor. When topsoil is stockpiled for later use, the stockpiles shall be maintained free of weeds. Weed growth shall be prevented by the application of a suitable herbicide or by frequent cutting or pulling of plants.

17-07. PLACING TOPSOIL. - The topsoil shall be uniformly distributed on the designated areas and evenly spread, and in sufficient depth to compensate for any shrinkage, so that the thickness of the compacted topsoil shall be as provided by the drawings. Where not shown on the drawings, the topsoil shall be 6" (six inches) minimum thickness. The topsoil depth shall be measured perpendicular to the plane of the finished grade. The spreading shall be performed in such a manner that fine grading, fertilizing, liming and seeding can proceed with little additional soil preparation or tillage. Irregularities in the surface resulting from operations thereon shall be corrected to prevent the formation of depressions where water will stand. Topsoil shall not be placed or worked when it or the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to the proposed seeding or to proper grading. Topsoiling shall be performed only when it can be followed within a reasonable time by seeding.

17-08. PREPARATION OF SEEDBED. - a. General. - It shall be demonstrated to the Contracting Officer before starting work that the application of fertilizers, lime, and seed required will be made uniformly and at the specified rates.

b. Fine Grading. - The seedbed shall be brought to the required finished grades, free from unsightly variations, lumps, ridges, and depressions, through successive stages of light rolling, fine grading, and hand and machine raking operations. Grades and elvations shall be properly set and marked by means of stakes, string lines, spot elevations and similar means when necessary or when required by the Contracting Officer. Rolling shall be accomplished with a roller weighing approximately 75 pounds per foot of width. During such operations and prior to seeding, the surface shall be cleared by whatever means are necessary including hand raking of all stones, stumps, or other objects larger than

1 inch in thickness or diameter, and of all roots, brush, wire, grade stakes, and other objects that may be a hindrance to maintenance operations. A finely pulverized seedbed shall be formed. The elevation of the seedbed surface at any point shall match exactly the elevation at adjacent pavement edges, curbs, manholes rims and finish grade elevation lines at structures, and overlot shall not vary more than plus or minus one tenth of a foot (.1C ft.) from the elevations shown on the drawings or interpolated from the contours, sections, or details.

c. Application of Fertilizer and Lime. - Fertilizer and lime shall be distributed uniformly over the areas specified to be topsoiled and seeded, in accordance with the following schedules:

Material	Rate in Pounds Per 1,000 S.F.
Fertilizer	25
Lime	100

Each material shall be incorporated independently into the top 3 inches of soil by disking, harrowing, drill, or other methods acceptable to the Contracting Officer during fine grading operations. Distribution of fertilizer and seed may be accomplished simultaneously by means of an approved seed drill equipped to sow seed and distribute fertilizer at the same time at the appropriate stage for seeding operations.

d. Leveling. - Any undulations or irregularities in the surface resulting from tillage, fertilizing, liming, or other operations shall be leveled out before seeding operations are begun. No seeding shall be done until the prepared seedbed has been approved by the Contracting Officer.

17-09. PLANTING SEED. - a. General. - All seeding work shall be done between the dates of 15 April and 1 June or between 15 August and 15 September, except as otherwise directed in writing by the Contracting Officer. A method of sowing satisfactory to the Contracting Officer shall be employed, making use of approved mechanical power-drawn drills or seeders, mechanical hand-seeders, or other approved methods. Regardless of the type of sowing equipment used, the seedbed shall be pulverized to a depth of three inches before seed is applied. When drills are used, provision shall be made by markers or other means to assure that the successive seeded strips will overlap or be separated by a space no greater than the space between the rows planted by the equipment being used. When delays in operations carry the work beyond the most favorable planting season for the species designated, or when conditions are such, by reasons of drought, high winds, excessive moisture, or other factors, that satisfactory results are not likely to be obtained, the Contracting Officer will stop the work, and work shall be resumed only when directed. If inspection, during seeding operations or after there is a show of

green, indicates that strips wider than the space between the rows planted have been left, or other areas skipped or too sparsely seeded, the Contracting Officer may require corrective work and the sowing of additional seed on such areas. When the equipment used leaves wheel marks, tire marks, or ruts in the seedbed, such marks and ruts shall be removed by hand raking or the addition of topsoil and seeded.

b. Rates. - Seed shall be sown at the minimum rate of 150 lbs. per acre.

c. Broadcast Seeding. - Seed shall be broadcast by approved sowing equipment. The seed shall be uniformly distributed over the designated areas. Half the seed shall be sown with the sower moving in one direction, and the remainder shall be sown with the sower moving at right angles to the first sowing. The seed shall be covered to an average depth of 1/4-inch by means of a brush harrow, chain harrow, cultipacker, or other approved device. Broadcast seeding shall not be done during windy weather.

d. Drill Seeding. - Drill seeding shall be done with approved equipment with drills not more than 2 inches apart. The seed shall be sown uniformly over the designated areas, and covered to an average depth of 1/4 inch concurrently with the sowing.

e. Floss Spraying. - The application of fertilizer and seed to a seedbed prepared in accordance with the provisions of this section of the specifications, may be accomplished in one operation by the use of an approved spraying machine. The materials shall be mixed with water in the machine and kept in an agitated state in order that the materials may be uniformly suspended in the water. The spraying equipment shall be so designed that when the solution is sprayed over an area resulting deposits of fertilizer and seed shall be equal in quantity to those quantities specified herein. In no case shall lime be sprayed simultaneously with fertilizer and seed, nor shall any materials be used that have been standing in solution for a period exceeding 8 hours. After the spraying has been accomplished, the surface of the loam shall be compacted by rolling as specified below. If the results of the spraying operations are unsatisfactory, the contractor will be required to abandon this method and to apply the materials as described hereinbefore. The floss spraying method of seeding shall not be used unless specifically authorized for certain areas by the Contracting Officer.

17-10. COMPACTING. - Immediately after the operations specified above have been completed, the entire area shall be compacted by means of a cultipacker, roller, or other approved equipment weighing 60 to 90 pounds per linear foot of roller. If the soil is of such type that a smooth or corrugated roller cannot be operated satisfactorily, a pneumatic roller (not wobble-wheel) will be required. The pneumatic roller shall

have tires of sufficient size so that complete coverage of the soil surface is obtained. When a cultipacker or similar equipment is used, the final rolling shall be at right angles to the existing slopes to prevent water erosion or at right angles to the prevailing wind to prevent dust, as directed by the Contracting Officer.

17-11. APPLYING MULCH. - The mulch shall be spread uniformly on all seeded areas in continuous blanket, as follows: Straw or hay at the rate of 2 tons per acre. If the mulching material is too long and brittle for proper securing in the surface soil, it shall be cut by an ensilage cutter or other equipment to lengths of not more than 8 inches and watered as needed before spreading, to assure proper securing of mulch into the soil as specified hereinafter. The mulch shall be spread by hand or by use of a manure spreader, a modified grain combine with straw-spreader attachment, a blower or other suitable approved equipment. Mulching shall be started at the upper part of a slope, and shall continue uniformly until the area is completely covered.

17-12. SECURING MULCH. - Immediately following the spreading of the mulch, the material shall be anchored to the soil by a V-type wheel land-packer, a disk harrow set to cut only slightly, a rotary hoe run backwards, or other suitable approved equipment which will secure the mulch firmly in the ground to form a soil binding mulch and prevent loss or bunching by wind. The number of passes over the mulch needed to secure it firmly to the soil shall be as determined by the Contracting Officer, but shall in no case exceed three passes. On slopes where machinery cannot be used, mulch shall be retained in place by a shallow covering of earth, by pressing into the soil at 18-inch intervals with a spade or other approved tool, by twine, stakes, or brush, or by other suitable means which will not be detrimental to subsequent maintenance.

17-13. REMOVAL OF MULCH. - Whenever in the opinion of the Contracting Officer the mulch material becomes injurious to the treated area because of decomposition, matting or bunching, or when growth of grass is retarded or maintenance impeded, the contractor shall carefully remove the mulch, transport it, and deposit it in an approved spoil area.

17-14. PROTECTION. - The topsoiled and seeded areas shall be protected against traffic or other use by erecting barricades or a substantial wire and stake enclosure immediately after seeding and mulching operations have been completed, and by placing warning signs of a type approved by the Contracting Officer on the completed areas. The contractor shall repair any damage resulting from his operations. All mulch material which has been removed from the site by wind or from other causes shall be replaced and secured. Repair work which is required because of the contractor's negligence shall be performed without cost to the Government.

17-15. CLEAN-UP. - The contractor shall leave each area neat and clean, with adjacent turf and tree-covered areas raked of extraneous matter, and with all debris removed from the site. Any paved area over which hauling operations are conducted shall be kept clean and any top-soil, mulch, clippings, or other material which may be brought upon the paved surface shall be removed promptly.

17-16. ESTABLISHMENT. - a. General. - The contractor shall be responsible for the proper care of the seeded and mulched areas during the period when the grass is becoming established including watering. This period shall extend for 45 days after the completion of the seeding on the entire project except that when seeding is completed after 15 September, the maintenance period shall continue until 15 May of the succeeding year.

b. Watering. - All seeded areas shall be watered during the establishment period whenever considered necessary by the Contracting Officer. Seeded areas on which growth has started shall be watered to a minimum depth of 2 inches to assure continuing growth. Watering shall be done in a manner which will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment. The contractor shall furnish sufficient watering equipment to apply one complete coverage to the seeded areas in a 72-hour period. Such watering equipment to consist of tank trucks, pumps, portable irrigation pipe, sprinklers, fittings and appurtenant subsidiary items.

c. Mowing. - The seeded areas shall be mowed with approved mowing equipment to a height of 2 inches when the average height of grass becomes 4 inches for initial mowing and 3 inches for all subsequent mowings. If weeds or other undesirable vegetation threaten to smother the planted species, such vegetation shall be mowed or, in the case of exceedingly rank growth, be uprooted, raked, and removed from the area.

d. Refertilizing and Reseeding. - Areas which, in the opinion of the Contracting Officer, fail to show a good growth of grass during the period of establishment cited above shall be tilled, refertilized, regraded and reseeded. Areas that require tilling, refertilization and reseeding will be designated by the Contracting Officer at least 15 days prior to the period specified for the next seeding season. The fertilizer shall be distributed on the areas to be reseeded during a period when the surface is dry. Reseeding shall be done in a manner that will cause a minimum of disturbance to the existing stand of grass. The fertilizer and seed shall be of the same grade, physical condition, packaging and marking, and shall be applied uniformly at the rates specified hereinbefore.

e. Herbicide Application. - The Contracting Officer may require the application of 2, 4-D herbicide during the maintenance period if, in his opinion, the amount of weedy vegetation present on the seeded areas so warrants, at no additional cost to the Government.

17-17. REPAIR. - When any portion of the surface becomes gullied, eroded, or otherwise damaged following seeding and mulching, or the seedlings have been winter killed or otherwise destroyed through no fault of the contractor, the contractor shall, within 15 days of written notice by the Contracting Officer, restore the damaged portions to re-establish the condition of the finished grade prior to seeding. The area shall then be refertilized, reseeded and mulched as specified herein. An equitable adjustment will be made in the contract price, provided that the gullying, erosion, winter killing and other damage occurs after completion of all work required by this section of the specifications and the work done has been approved by the Contracting Officer.

17-18. COVER SEEDING. - When cover seeding is done, it will be accomplished without fine grading, fertilizer, or liming operations. The seed shall consist of Hairy Vetch or Common Buckwheat, applied at the rate of 60 pounds per acre. When cover seeding is directed by the Contracting Officer, an equitable adjustment in the contract price will be made. When cover seeding is done by the contractor for his own convenience and the protection of his work, it shall be done at no additional cost to the Government.

17-19. PAYMENT. - a. No separate payment will be made for the work specified in this section, except as provided below, and all costs in connection therewith shall be considered as a subsidiary obligation of the contractor and included under the contract price for "Preparation of Site", "Unclassified Excavation-General", "Unclassified Excavation-Borrow", and "Service Road".

b. In the event work as specified in Paragraph 17-18 is required, equitable adjustment will be made to the contract. When work is required as specified in Paragraph 17-17, an equitable adjustment to the contract may be made as provided for in that paragraph.

c. The quantities and types of lime, fertilizer and seed specified indicate anticipated average requirements. In the event analysis of topsoil used indicates changes are necessary in quantities or type of materials, a suitable adjustment in the contract unit price will be made.

STANDARD FORM 21
JANUARY 1961 EDITION
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.401

BID FORM
(CONSTRUCTION CONTRACT)

REFERENCE
Serial No. CIVENG-19-016-63-56

Read the Instructions to Bidders (Standard Form 22)
This form to be submitted in duplicate

DATE OF INVITATION
15 March 1963

NAME AND LOCATION OF PROJECT
CONSTRUCTION OF NORTHFIELD BROOK DAM AND APPURTENANT STRUCTURES, NORTHFIELD BROOK, CONNECTICUT

NAME OF BIDDER *(Type or print)*

(Date)

TO: Division Engineer
U. S. Army Engineer Division, New England
424 Trapelo Road
Waltham 54, Mass.

In compliance with the above-dated invitation for bids, the undersigned hereby proposes to perform all work for Construction of Northfield Brook Dam and Appurtenant Structures, Northfield Brook, Connecticut

in strict accordance with the General Provisions (Standard Form 23-A), Labor Standards Provisions Applicable to Contracts in Excess of $2,000 (Standard Form 19-A), specifications, schedules, drawings, and conditions, for the following amount(s)

See Attached Unit Price Schedule

Affidavit made by the bidder concerning Parent Company and Employer Identification Number, attached hereto, forms a part of this bid.

Supplement to Bid Form, Sheets numbered 1 and 2 and Plant and Equipment Schedule attached hereto forms a part of this bid as does attached Unit Price Schedule.

The undersigned agrees that, upon written acceptance of this bid, mailed or otherwise furnished within calendar days (60 calendar days unless a different period be inserted by the bidder) after the date of opening of bids, he will within 10 calendar days (unless a longer period is allowed) after receipt of the prescribed forms, execute Standard Form 23, Construction Contract, and give performance and payment bonds on Government standard forms with good and sufficient surety.

The undersigned agrees, if awarded the contract, to commence the work within
15 calendar days after the date of receipt of notice to proceed, and to complete the work within
* calendar days after the date of receipt of notice to proceed.
*For completion date or dates see Paragraph SC-1 of the specifications.

(Continue on other side)

Receipt of Amendments: The undersigned acknowledges receipt of the following amendments of the invitation for bids, drawings, and/or specifications, etc. *(Give number and date of each)*:

The bidder represents *(Check appropriate boxes)*:

(1) That he ☐ is, ☐ is not, a small business concern. *(For this purpose, a small business concern is a business concern, including its affiliates, which (a) is independently owned and operated, (b) is not dominant in its field of operation, and (c) had average annual receipts for the preceding three fiscal years not exceeding* $7,500,000. *For additional information see governing regulations of the Small Business Administration.)*

(2) (a) That he ☐ has, ☐ has not, employed or retained any company or person (other than a full-time bona fide employee working solely for the bidder) to solicit or secure this contract, and (b) that he ☐ has, ☐ has not, paid or agreed to pay any company or person (other than a full-time bona fide employee working solely for the bidder) any fee, commission, percentage or brokerage fee, contingent upon or resulting from the award of this contract; and agrees to furnish information relating to (a) and (b) above as requested by the Contracting Officer.

(For interpretation of the representation, including the term "bona fide employee," see Code of Federal Regulations, Title 41, Subpart 1-1.5.)

(3) That he operates as an ☐ individual, ☐ partnership, ☐ joint venture, ☐ corporation, incorporated in State of _____

Enclosed is bid guarantee, consisting of

in the amount of

NAME OF BIDDER *(Type or print)*	FULL NAME OF ALL PARTNERS *(Type or print)* (with residential addresses)
BUSINESS ADDRESS *(Type or print)*	
BY *(Signature in ink. Type or print name under signature)*	
TITLE *(Type or print)*	

DIRECTIONS FOR SUBMITTING BIDS

Envelopes containing bids, guarantee, etc. must be sealed, marked, and addressed as follows:

Division Engineer, U. S. Army Engineer Division,
New England, 424 Trapelo Road, Waltham 54, Mass.

Bids may be delivered in advance to the Bids Receving Desk in Bldg. 109S at above address, or delivered directly to the Contracting Officer in Building 126 (Theater) just prior to the bid opening.

CAUTION: Bids should not be qualified by exceptions to the bidding conditions.

Serial No. CIVENG-19-016-63-56

NORTHFIELD BROOK DAM

UNIT PRICE SCHEDULE

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
1	Preparation of Site	1	Job	L.S.	$
2	Reservoir Clearing	1	Job	L.S.	
3	Control and Diversion of Water	1	Job	L.S.	
*4	Unclassified Excavation - General	75,000	C.Y.	$	
*5	Unclassified Excavation - Borrow	630,000	C.Y.		
*6	Rock Excavation - General	54,000	C.Y.		
7	Omitted				
8	Safety Mesh	7,000	S.Y.		
9	Rock Bolting	50	Ea.	$16.00	800.00
10	Machine Cleaned Bedrock Surfaces	2,000	Sq.	$	
11	Hand Cleaned Bedrock Surfaces	1,400	Sq.		
*12	Compacted Impervious Fill	480,000	C.Y.		
13	Compacted Impervious Back-fill	1,100	C.Y.		
*14	Compacted Random Fill	32,000	C.Y.		
15	Compacted Pervious Fill	35,000	C.Y.		
16	Compacted Gravel Fill	13,000	C.Y.		
17	Compacted Gravel Backfill	500	C.Y.		
18	Compacted Processed Sand Fill	3,000	C.Y.		

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
19	Additional Rolling of Fill	125	Hrs	$_____	$_____
20	Gravel Bedding	25,000	C.Y.	_____	_____
21	Road Gravel	500	C.Y.	_____	_____
*22	Rock Fill	20,000	C.Y.	_____	_____
*23	Rock Slope Protection	34,000	C.Y.	_____	_____
24	Foundation Drilling and Grouting				
	a. Mobilization and Demobilization	1	Job	L.S.	_____
	b. Drilling 1-1/2" (EX) Grout Holes	6,700	L.F	$_____	_____
	c. Drilling 3" (NX) Drain Holes	170	L.F.	_____	_____
	d. Drilling 3" (NX) Exploratory Holes	130	L.F.	_____	_____
	e. Portland Cement in Grout	1,700	C.F.	_____	_____
	f. Sand in Grout	100	C.F.	_____	_____
	g. Placing Grout	1,800	C.F.	_____	_____
	h. Connection to Grout Holes	420	Ea.	$ 5.00	2,100.00
25	Anchor Bars - 6' Setting	8	Ea.	$_____	_____
26	Anchor Bars - 10' Setting	44	Ea.	_____	_____
27	Concrete-Outlet Works-Inlet and Outlet Structures	450	C.Y.	_____	_____
28	Concrete-Outlet Works-From Sta. 3+15.5 to Sta. 8+59.5	750	C.Y.	_____	_____

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
29	Concrete-Spillway-Wall Lining, Retaining Wall, and Weir	650	C.Y.	$_____	$_____
30	Cement	3,000	Bbl.	_____	_____
31	Steel Reinforcement	20,000	Lb.	_____	_____
32	Pipe Conduit	1	Job	L.S.	_____
33	Sluice Gate-2' x 3'	1	Job	L.S.	_____
34	Sluice Gate-3' x 3'	1	Job	L.S.	_____
35	Air Vent	1	Job	L.S.	_____
36	Bubble Gage Shelter	1	Job	L.S.	_____
37	Chain Link Fencing	2,500	L.F.	$_____	_____
38	Gates, Double, Chain Link	3	Ea.	_____	_____
39	Log Boom	1	Job	L.S.	_____
40	Staff Gages	1	Job	L.S.	_____
41	Miscellaneous Metal Items-Intake Structure	1	Job	L.S.	_____
42	Bituminous Concrete Pavement	1	Job	L.S.	_____
43	Wood Stop Logs	1	Job	L.S.	_____
44	Service Road	1	Job	L.S.	_____
				TOTAL	$_____

NOTES: 1. The work will be awarded as a whole to one bidder.

2. The bidder shall indicate below the type of cement he proposes to furnish (See Paragraph 9-02). One option only will be elected.

Portland Cement ☐

Portland Blast Furnace Slag Cement ☐

3. Only quantities for items with an asterisk adjacent to Item No. are subject to the provisions of Subparagraphs SC-7a and SC-7c of the SPECIAL CONDITIONS.

PLANT AND EQUIPMENT SCHEDULE

Available Plant to be Used

Excavation Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Drilling Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Concreting Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Material Handling Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Add additional sheets if required.

PLANT AND EQUIPMENT SCHEDULE

Available Plant to be Used
Pumping Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Earth Embankment - Rolled Fills

Excavation and Transportation - Spreading and Rolling

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Add additional sheets if required.

PLANT AND EQUIPMENT SCHEDULE

Available Plant to be Used

Miscellaneous Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Add additional sheets if required.

PERFORMANCE OF WORK BY CONTRACTOR

The undersigned will perform the following items of work with his own organization:

Items	Est. Cost	% of Total Work

Add additional sheets if required.

Name of Firm or Individual

By _____
(Signature)

_____
(Title)

A F F I D A V I T

PARENT COMPANY AND EMPLOYER IDENTIFICATION NUMBER.

(a) Bidder represents that he /__/is, /__/is not, owned or controlled by a parent company. For this purpose a parent company is defined as one which either owns or controls the activities and basic business policies of the bidder. To own another company means the parent company must own at least a majority (more than 50 percent) of the voting rights in that company. To control another company such ownership is not required; if another company is able to formulate, determine or veto basic business policy decisions of the bidder such other company is considered the parent of the bidder. This control may be exercised through the use of dominant minority voting rights, use of proxy voting, contractual arrangements, or otherwise.

(b) If bidder is owned or controlled by a parent company, insert in the space below the name and main office address of the parent company.

_____ _____

Name Address

(c) Bidder will provide in the applicable space below, if he has no parent company, his own Employer's Identification Number (E. I. No.) (Federal Social Security Identification Number used on Federal Tax Returns), or, if he has a parent company, the E. I. No. of his parent company.

Bidder's E. I. No._____

Parent Company's E. I. No._____

SUPPLEMENT TO BID FORM
(Construction Contract)

If a bid or modification to a bid based on unit prices is submitted and provides for a lump sum adjustment to the total estimated cost, the application of the lump sum adjustment to each unit price, including lump sum units, in the bid schedule must be stated or, if it is not stated, the bidder agrees that the lump sum adjustment shall be applied on a prorata basis to every unit price in the bid schedule.

In case of error in the extension of prices, the unit price will govern.

The bidder warrants that he has available or under his control plant of the character and in the amount required to complete the proposed work within the specified time.

It is hereby warranted that in the event award is made to the bidder, there will be furnished under this contract, or used in the performance of the work covered by this contract, only such unmanufactured articles, materials, and supplies as have been mined or produced in the United States and only such manufactured articles, materials, and supplies as have been manufactured in the United States substantially all from articles, materials, or supplies mined, produced or manufactured, as the case may be, in the United States, except as noted below or otherwise indicated in this bid or authorized in the invitation.

Mistakes in Bids. - The bidder hereby waives that portion of any alleged mistake or mistakes in his bid as submitted which falls within the following amounts:

If bid is $250,000 or less -- 5% of the bid;

If bid is more than $250,000 and less than $500,000 - $12,500 plus 4% of the bid over $250,000;

If bid is $500,000 or more, and less than $1,000,000 - $22,500 plus 3% of the bid over $500,000;

If bid is $1,000,000 or more - $37,500 plus 2% of the bid over $1,000,000.

In cases where the allegation of mistake exceeds the above waived amounts and the request for correction is allowed, such amount will be excluded from the contract price; however, the amount waived as provided herein will not be deducted for the purpose of evaluating bids to determine the low bidder.

SUPPLEMENT TO BID FORM
(Construction Contract)

The above waiver does not apply to any clerical mistake which is obvious or apparent on the face of the bid including but not limited to (1) a mistake in the extension of a unit price or prices; (2) a mistake in totaling the sums of various bid items; (3) obviously misplaced decimal point or (4) failure to insert the unit price where amount intended can be determined from face of bid.

This clause is not applicable to allegations of mistakes which, if allowed, would result in a reduction in the bid price.